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CONSUMPTION

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ITS

NATURE, SYMPTOMS, CAUSES, PREVENTION, CURABILITY AND TREATMENT

BY

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LATE PHYSICIAN AND SURGEON IN ORDINARY TO HIS MAJESTY THE
KING OF SIAM

LONDON
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PREFACE.

NOTWITHSTANDING the numerous observations of morbid anatomists by which the frequency of recovery from consumption, or phthisis, has been absolutely demonstrated, it is unquestionable that this disease is still regarded as incurable, not only by the great majority of the general public, but even by most medical practitioners. That such a belief on the part of a medical man must be most disastrous to the sufferer from consumption who puts himself into his hands is self-evident. For it is not to be supposed that a practitioner can do much good if he believe his patient's ailment to be insusceptible of cure; and a striking warning of the evil effects of such a belief is given in these words of the late Dr Felix Von Niemeyer: "From the experience which I have had in later years, I am fully convinced that I formerly lost many a patient from galloping consumption simply because I regarded his case as hopeless from the very first."

I trust that this little work may be read both by the medical profession and by the general public. It has a claim on the attention of medical men, inasmuch as it contains, I believe, the first exposition of Dr Brehmer's theory of the causation of consumption that has yet appeared in the English language. This theory alone is adequate to render intelligible the many facts known on this subject, but of which an explanation was not even attempted until the appearance of Dr Brehmer's inaugural thesis for his doctorate in medicine.

I am hopeful that the perusal of the following pages may prove useful to non-medical readers, in teaching them how consumption may be avoided, and how eminently curable the disease is. Having had this end in view, I have throughout avoided the use of technical phraseology.

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CONSUMPTION.

CHAPTER I.

THE NATURE OF CONSUMPTION.

BEFORE entering into consideration of that most fatal disease, consumption, it will be well to give a short description of the structure and functions of the healthy lungs and respiratory passages.

Passing through the nostrils into the pharynx, or bag into which the mouth and nostrils open behind, and which surmounts the gullet and windpipe, the air next enters the larynx, a triangular box-like organ, containing the vocal cords, and furnished with a lid, the epiglottis, which is opened during respiration, and closed in the act of swallowing, thus preventing food and drink from descending except through the gullet, which lies behind. The air then passes down the windpipe, which is an elastic tube composed of alternate rings of gristle and membrane, dividing into the two bronchial tubes, one on each side, which enter the lungs, and there divide and subdivide into minute tubes called bronchioles. Through the bronchial tubes and bronchioles the air continues to pass until it permeates the whole substance of the lungs. These organs are situated one on each side of the heart, great blood-vessels, windpipe, and bronchial tubes, and overlap them in front, the edges of the lungs being in contact with each other. The substance of the lung is light, spongy, and elastic; it is made up of small lobules, connected with each other by loose elastic fibres, in which lie minute blood-vessels, lymphatic vessels, and nerves. The lobules themselves are made up of honeycomb-like air-cells, which are in communication with the finest branches into which the bronchial tubes divide.

Lining the entire respiratory passages is a mucous membrane, which becomes finer and finer as it passes downwards into the air-cells of the lung, where it is of extreme thinness. Beneath this mucous membrane there is a network of minute blood-vessels, which in the lung is derived from the branches of the pulmonary artery and is of great closeness and fineness, the meshes being but little wider than the vessels themselves. The surface of the mucous membrane in the windpipe, the bronchial tubes, and their subdivisions is coated with ciliated epithelial cells, so called from their being furnished with hair-like bodies, something like eyelashes, which move perpetually in such a manner as to produce a current in the mucus of the passages always in the same direction, namely, *from* the lungs upwards. They also act to some extent in filtering the air from dust before it enters the air-cells.

So much for structure.

Let us now give a brief sketch of the function of the lungs.

The blood, as it is returned to the right side of the heart from the body generally, is no longer fit to sustain life. It is dark in colour and in its passage through the various tissues has undergone certain changes in composition, the most important of which are loss of oxygen and gain of carbonic acid gas.

But from the right ventricle of the heart it is sent into the pulmonary artery, whence it passes by the right and left branches of this vessel into the lungs, and is exposed to the air while in the delicate capillary vessels which line the enormous surface of the air-cells, where it loses its excess of carbonic acid gas and is refreshed by a new supply of oxygen. Thus the blood is rendered once more fit to be distributed throughout the body; and the great function of the lungs is to accomplish this.

Now, let us ask what consumption is. Ulceration of the lung, however produced, is attended with progressive waste of the body, which justifies the name "consumption" being applied to it.

It matters not whether the ulcer be the result of disease, or be due to the mechanical injury produced, say, by a cherry stone having got into the windpipe; in either case we have the same characteristic train of symptoms,—general wasting, loss of appetite, night sweats, cough with foul or bloody expectoration, and so forth,—which distinguish the disease that is the scourge of most countries where people congregate in large communities.

Up to a comparatively recent date, modern physicians used "consumption" and "tuberculosis of the lungs" as equivalent terms. It was considered that the deposition of little round or angular bodies (tubercles) in the lung was invariably the first morbid process that took place in all cases of consumption; that these little bodies were grey and gristly when first formed, afterwards becoming yellow and soft by undergoing incomplete fatty degeneration; and that, separate at first, they soon united either into a single large mass or many smaller ones. This was believed to take place either by the deposition of new tubercles between the old, or by those first formed exciting inflammation in the intervening tissue, and the product of this inflammation (whether pus or lymph) undergoing the same incomplete fatty degeneration that took place in the tubercles.

Many medical practitioners of eminence still hold that this is the usual manner in which phthisis begins, and point to the frequent presence of isolated tubercles, both grey and yellow, in the lungs of patients who have died from consumption, as a proof that the cheesy-looking masses and the cavities in other parts of the same lung are due to the aggregation of and changes in tubercles. But isolated tubercles are by no means invariably found in the lungs of phthisical patients; and the more generally adopted view at the present day is, that the cheesy masses are simply collections of inflammatory lymph or pus which have undergone incomplete fatty degeneration, and that the isolated tubercles, when present, are the results of the absorption into the general circulation or into the lymphatic vessels of this cheesy substance, not in a state of solution, but as minute solid particles which have become impacted in the tissues, and have acted as so many centres of irritation and inflammation.

This view I think the more correct as concerns the vast majority of cases of consumption, and it is justified by the fact that in all cases of tuberculosis whatever (understanding by "tuberculosis" the presence of those little granules before mentioned in any part of the body) a cheesy centre can be found somewhere else in the system. Frequently it is the glands in the neck, or those surrounding the bronchial tubes, that have inflamed and undergone this change; but any product of inflammation that has dried up and become cheesy may be a centre from which particles can be carried into the circulation and deposited in the lungs, brain, or bowels, giving rise to hectic fever, delirium, diarrhœa, and in almost every case proving rapidly fatal. This is what is known to medical men as "acute miliary tuberculosis"; the term "acute" being applied because of the rapid course of the disease, and "miliary" because many of the individual tubercles are about the size of a millet seed, though the great majority are much smaller.

Acute miliary tuberculosis is, however, a comparatively rare disease, except as supervening on chronic phthisis, to the consideration of which we will now turn.

In the large majority of consumptive patients it is at the upper part of the lung that the local mischief begins; but it can scarcely be too strongly impressed on the public mind that any inflammatory process affecting any part of the lungs or respiratory passages may lead to consumption.

The progress of the disease is usually divided into three stages—the first, that of consolidation; the second, that of softening; the third, that of excavation.

Let us examine these stages in detail, and indicate how they may be detected by any person who chooses to procure a stethoscope, and first make himself acquainted with the sounds to be heard on listening to the healthy lungs.

First, as to those healthy sounds. On putting the small end of the stethoscope to the chest of a healthy person under the collar bone, and putting the ear to the other end of the tube, the sounds first heard will probably be those of the heart, as these are more marked in character than the sounds of the lung. Continue to listen, however, paying no attention to the sharp, well-defined, double sound of the heart, and it will soon be noticed that a soft blowing sound is heard with each inspiration and expiration, the former being more prolonged than the latter. While still listening, engage the person in conversation, and his voice will be heard to sound just as usual, little or no perceptible vibration being communicated to the stethoscope.

All this is altered in the first stage of consumption. Here a limited portion of the lung (and it may be as well to mention now that an essential feature of consumption is the limitation of the lung affection) is suspended as a breathing organ by reason of the air-cells being blocked up with blood or inflammatory matter. On listening to such a lung, we find that the gentle sound of healthy respiration is gone, and is replaced by a rougher note. The expiratory sound, moreover, is heard to be more prolonged than in the healthy organ. If the patient speaks while we are listening to his chest, his voice is heard as if it were spoken into the tube of the stethoscope, and the instrument may be felt to vibrate between our fingers.

Now, to what is this change due? The soft respiratory sounds heard in the healthy lung were caused by the air passing into and from the minute tubes and air-cells. These have been blocked up in the patient before us, and hence the coarser sounds of the larger tubes, inaudible before, are now the only ones we can hear. The voice sounds louder because the consolidated lung is a better conductor of vibrations than the spongy healthy organ; and to this same cause is due the possibility of hearing the coarse sounds of the deep-seated larger tubes, as well as the apparent prolongation of the expiratory sound. Expiration, however, is not really prolonged; but, whereas the healthy lung transmits the sound of the first part only of expiration, the consolidated organ enables us to hear a murmur for almost the entire duration of the process.

What has just been described is characteristic of the first stage of phthisis; but, it may be asked, is it characteristic of this disease alone? From the detection of those physical signs only, is the medical man warranted in saying that his patient is in the first stage of consumption? I think not. No one can with propriety be said to be suffering from consumption who is not wasting away more or less; and persons may be found in whom may be detected all those signs, who are yet strong and even gaining weight. But the medical man may and ought to say to such a person that he contains within him the seeds of consumption, which will be very apt to germinate should any exciting cause stimulate them; and the patient should therefore be warned to take every means to preserve and improve his health, and encouraged to hope that by attention to this the morbid matter which blocks a portion of his lung may be absorbed.

If, however, to the signs described there should be added cough, hectic fever, night sweats, pains in the chest, and general wasting (whether all or only some of these symptoms be present), *then* there can be no doubt as to the patient's being in the first stage of consumption; and the medical man who hesitates to make such a patient aware of his state is highly culpable. It is doubtless most painful to have to tell any one that he is consumptive; but there are few medical men of large experience who have not seen irremediable evil done by their professional brethren having disguised the true condition of such patients, and having thus indirectly encouraged them to neglect the means which might have effected or aided a cure. For it is in this early stage, naturally, that cure, either with or without medical aid, is most likely to take place; and that it does frequently take place is well known to all careful medical practitioners who have had much experience in the treatment of diseases of the lungs. Inflammatory matter or clotted blood that blocks the air-cells may be absorbed or coughed up before softening and ulceration of the lung substance have been induced, and the lung may be thus restored to a perfectly healthy state; and this even though fever, general wasting, and other characteristic symptoms of phthisis may have manifested themselves.

But suppose that this fortunate termination of the first stage of consumption be not obtained—what then? The inflammatory deposit or clotted blood which blocks up the air-cells of the lung may dry up and undergo incomplete fatty or chalky degeneration; and although, under such circumstances, there is a certain portion of the lung which is useless as a breathing organ, it cannot be said that the patient is suffering from consumption. He presents the main physical signs of the first stage of phthisis; but he is not wasting, feverish, or troubled with cough. He is, however, in a state that, we have already said, justifies the medical practitioner in warning him that he contains within him the germs of phthisis, and that the greatest care must be taken to preserve and improve his general health. In such a case the morbid matter is shut off from the healthy part of the lung by being surrounded with an increased growth of fibrous tissue.

But, instead of drying up or being expectorated, the clotted blood or inflammatory matter may act as a foreign body in the lung, and cause ulceration of the tissues which enclose it. Should this take place, it softens and breaks up itself; and this process is generally accompanied by great constitutional disturbance, such as attacks of shivering and fever, in addition to cough with profuse expectoration, and exhausting night sweats. In this stage the stethoscope reveals that the resounding character of the voice is no longer transmitted by the lung through the chest. Air enters the diseased portion of the lung more freely than in the first stage; but it merely enters a mass of broken up diseased matter, and accomplishes no useful object in so doing, as the capillary network in the walls of the air-cells, and even the air-cells themselves, have been broken up and destroyed. On the contrary, the air, carrying with it the germs of putrefaction from the outer world, is peculiarly liable to set up septic changes in the softened matter, and thus to give rise to a foul ulcer, from which the blood-vessels and lymphatics absorb the putrid products. Hectic fever is the natural result; and it is not difficult to understand how such a state of matters may go on from bad to worse, the lung substance being eaten away by ulceration, the primary deposit and the waste products of ulceration being expectorated, and a cavity thus formed, which constitutes the third stage of the disease.

In this, the stage of excavation, when we apply a stethoscope over the diseased part we can hear the air rush in with each act of inspiration, as if into a cavern; and, on the patient speaking, we hear his voice as if he were speaking through the instrument into our ear, somewhat as in the first stage of the disease, but without the same vibration being communicated to the stethoscope.

We have seen, then, that on listening to the healthy lung, the voice is heard without any peculiarity; and the same, or nearly the same, is true with respect to the second stage of consumption. In the first and third stages, however, the voice appears to be transmitted directly through the stethoscope.

The cause of this difference is plain. In the healthy lung, and the lung in the second stage of phthisis, a soft substance containing air intervenes between the organ of voice and the chest wall, and the sound is thus damped; whereas, in the first stage, the consolidated portion of lung, and, in the third stage, the cavity continuous with the windpipe and larynx, transmit the sound with ease.

The prospect of a favourable termination to the third stage of phthisis is good in proportion as the cavity is well defined. A large cavity distinctly marked off from the surrounding healthy lung tissue is much more likely to dry up and heal than another which, though small, burrows here and there irregularly into the surrounding parts.

In the third stage of phthisis, as in the second, there is danger that acute miliary tuberculosis may come on; but, in addition to this, there are two other dangers which are peculiarly liable to supervene in the third stage. These are, first, rupture of a blood-vessel, and second, perforation of the lung and consequent admission of air between the lung and the walls of the chest. The former of these two will occur under the following circumstances. The cavity has been formed somewhat rapidly and before time has been given for a sufficiently increased growth of fibrous tissue to constrict the blood-vessels that supplied the portion of lung now gone and replaced by a cavity. They lack support, therefore, and become distended at their weakest parts—that is to say, small aneurisms are formed on them, which, at any time, may ulcerate and burst. Fortunately, nature often prevents this by the slow manner in which the changes in the diseased lung proceed, the blood-vessels being gradually obliterated as the disease advances, and a supporting lining being formed in the walls of the cavity, which prevents the dilatation and rupture of the blood-vessels.

To render intelligible the result of perforation of the lung, it will be necessary to refer once more to the structure and functions of the organ. Each of the lungs lies against the walls of the cavity formed by the ribs and muscles between them, the backbone, and the breastbone. Between the lung and the ribs there is a fine double membrane, the pleura, the two halves of which are adherent to the outer surface of the lung and to the ribs respectively. Between the two halves of this membrane is a small quantity of fluid which acts like oil in machinery, enabling the lung, with its adherent portion of membrane, to glide smoothly over the portion attached to the ribs.

Now, let us see what happens in the act of respiration. The upper and middle ribs being elevated, and the midriff and lower ribs being depressed, the cavity of the chest is increased in volume, and air rushes into the lungs to fill the increased space, overcoming their natural elasticity, by virtue of which they tend to collapse or shrink upon themselves. In the act of expiration, the ribs and midriff resume their positions of rest, and the lungs contract in accordance with the diminished capacity of the chest, thus expelling a certain amount of their contained air. But what would be the result were communication to be made between the air-cells of the lung and the space between the two layers of the pleura? In such a case, air rushes in between the lung and the ribs, and the atmospheric pressure is now the same on the outside as on the inside of the organ, the natural elasticity of which is thus uncontrolled, and collapse, as a consequence, takes place. When the chest now expands in the act of respiration, the collapsed lung remains collapsed, air is no longer admitted to its cells, and its function as a purifier of the blood is lost. It will be evident to all that such a disturbance of respiration as is involved by the collapse of one of the lungs may readily hasten a fatal termination of the case in which it occurs, and, moreover, that such an eventuality is unlikely to take place, save in cases where the walls of the cavity are thin and soft. If they have been toughened by the growth of fibrous tissue, there is comparatively little chance of this unfortunate result.

What we have to hope for in the third stage of phthisis, is that the cavity will shrink and heal by its walls adhering to each other; and this, fortunately, often happens. What we have to fear are, rupture of blood-vessels; perforation of the lung and consequent escape of air between the lungs and the ribs (pneumothorax); and lastly, acute inflammation and catarrh.

CHAPTER II.

THE SYMPTOMS OF CONSUMPTION.

THESE have been in some measure considered in the previous chapter, principally, however, in regard to the anatomical changes produced in the healthy lung by the morbid processes, and to the signs made manifest by physical instrumental examination. We shall here consider chiefly the symptoms experienced by the patient himself, and detectable by the physician, or even by non-professional persons, before characteristic physical signs can be discovered by the most careful examination.

In about one-fourth of all cases of consumption the disease has been evolved insidiously, without its having been remarked as supervening on any of the simple inflammatory affections of the lungs and air-passages.

In such cases the answers I have obtained from the large majority of consumptive patients who have consulted me with respect to the state of their lungs, have convinced me that by far the most frequent premonitory symptoms are general feebleness and impaired digestion. The patient has remarked, long before he felt positively ill, that he was exhausted after doing work which he could formerly accomplish without suffering from the slightest fatigue. He has noticed, moreover, that, whereas formerly his meals were a source of pleasure to him, he had ceased to enjoy his food, and felt repelled by dishes before thought by him delightful. He has also remarked that digestion had ceased to be carried on with the same pleasant absence of consciousness of the process as formerly, and that rich fatty food especially had become odious to him. His friends have observed that, during this period of indigestion and general debility, he has been losing flesh. Indeed, this fact daily forces itself on his own attention as he puts on his clothing,—the garments which once fitted well have now become a world too wide for his shrunken body and limbs. This premonitory feebleness, indigestion, and loss of flesh are accompanied by shortness of breath, hurried respiration, and weak rapid pulse, after exertion; but when resting the pulse and breathing are perfectly natural.

Another premonitory symptom to which sufficient attention has not yet been attracted is lowered temperature of the body. This was first remarked as a threatening of consumption by Mr Alcock, and mentioned by him in his article "On the Nature and Variations of Destructive Lung Disease," published in the "Army Medical Reports" for 1872. I do not now allude to mere chilliness of the skin, but to the temperature of the interior of the body, as ascertained by the bulb of a thermometer placed under the tongue while the lips are closed over the stem. This depression of body temperature I have repeatedly observed in persons who have applied to me on account of suspected consumption, as evidenced by feebleness, shortness of breath after slight muscular efforts, and loss of flesh, in whom, however, there was neither cough nor night sweats, nor any trace of lung disease to be detected by the most careful physical examination. The natural temperature of the human body is 98·4° Fahr.; but in such persons I have frequently seen it as low as 97·0° Fahr. in the morning, and 97·6° Fahr. in the evening.

Now, I have known of patients presenting such symptoms being positively assured by physicians of eminence that they had no reason whatever to apprehend the invasion of consumption, as there was entire absence of fever in their cases, and that fever was one of the invariable premonitory symptoms of that disease. It certainly is one of the most constant symptoms of the beginning of phthisis, perhaps the most constant of all, with the exception of loss of flesh; but it is not invariable as a symptom even of the actual presence of the disease. Then, moreover, it does not follow that the premonitory symptoms of any ailment must bear a resemblance to the symptoms of the disease itself. It cannot be too strongly insisted on that any enfeebled condition of body, no matter what or how produced, especially if associated with wasting, should cause apprehension of consumption; and I look upon the debility indicated by diminished body temperature as one of the most valuable warnings we can have to use measures preventive of that disease.

A circumstance worthy of notice in connection with this is that Thomsen, a Danish investigator, when residing in Iceland, a part of the world where consumption is comparatively rare, found that the internal body temperature of twelve perfectly healthy natives averaged 37·27° centigrade, that is to say, from about $\frac{1}{4}$° to $\frac{3}{4}$° in excess of the temperature of other European races.

The symptoms already described are in all probability premonitory only, no actual disease of the lung being yet present. It must be remembered, however, that in the great mass of consumptive cases, perhaps indeed in all, there is a time when, though no lung mischief can be detected, the general condition of the patient justifies the physician in believing that he is in great danger of developing phthisis, if indeed the disease have not already set in. This general condition of the patient, indicative of developing phthisis, consists in loss of flesh, dry cough, paleness, with occasional bright flushes, hot palms, languor, and usually *elevated* body temperature, especially in the evening, with increased rapidity of pulse. If to these symptoms there be added spitting of blood, and exhausting sweats coming on towards morning, a positive assurance may be given of the existence of consumption, and this although the stethoscope does not enable us as yet to detect any abnormal sound. One often, however, hears a patient with such symptoms say, that he has been to a physician, who, after hearing a description of his case and examining his chest, has pronounced him free from phthisis, because he can detect no sounds characteristic of the disease. Such an opinion implies a belief that by instrumental means any morbid state of the lung may be detected, be it in any stage or of any extent whatever. This belief is, however, perfectly unjustifiable. There may exist a small consolidated portion of the lung, or even a small cavity, which, if deeply situated and surrounded on all sides by healthy tissue, will give absolutely no sign on stethoscopic examination.

But although neither by means of the stethoscope, nor by gentle percussion of the chest, are we able to detect the presence or absence of block or destruction of lung tissue in every case, there is another instrument which enables us to do so with ease. This is the "spirometer," the invention of Mr Hutchinson, who by means of this instrument has shown that the extreme breathing capacity of the healthy lungs, or the volume of air they are capable of expelling by forcible expiration after having been filled by the profoundest inspiratory act possible, is dependent chiefly on the stature of the individual, that it is also influenced to some extent by age and sex, but scarcely at all by the weight of the body or circumference of the chest. Thousands of experiments made by Mr Hutchinson in this country, and by Dr Wintrich in Germany, have shown that this volume of air (to which the term "vital capacity" is applied, as denoting the volume of air capable of being displaced by vital movements) reaches its highest point about the age of thirty, and that men from twenty to twenty-four years of age have a vital breathing capacity of from 22 to 24 cubic centimetres, and women, at the same period of life, of from 16 to

17½ cubic centimetres for each centimetre of height. In early and in advanced life the relation between breathing capacity and stature differs somewhat from the above, but has been ascertained and tabulated with equal accuracy.

It is by means of the spirometer alone that the physician is enabled to decide in doubtful cases whether consolidation or excavation of the lung be present or not; and patients are frequently to be seen whose distressing cough has caused themselves and their relations to fear the existence of serious lung mischief, but who can be shown to have a vital capacity of chest quite in accordance with that natural to their age and stature, and who can therefore be pronounced quite free from block or destruction of the air-cells of the lung. It need scarcely be said how inexpressibly glad information of this kind makes a patient who has come to the physician apprehending the worst; and the instrument which makes such information possible should find a place in the consulting-room of every physician who devotes special attention to diseases of the lungs.

It has often been alleged that the spirometer is of little or no value as an indicator of the breathing capacity of the lungs, as that practice or knack will enable one person to empty his lungs of air more completely than another. The close agreement between the results obtained by different experimenters proves, however, that continued practice does not enable one to show increased breathing capacity, if he have been careful from the first to expand his lungs to the very utmost, and then to expel the air into the instrument until he can expel no more.

The quickened respiration so often mentioned as one of the most marked symptoms of phthisis is by no means a constant one. If present when the patient is at rest, it simply depends on the existence of fever; when this is absent, hurried breathing is so likewise, even though a large part of the air-cells of the lung be completely blocked up, and the breathing capacity of the organ much lessened. This is quite intelligible. Hurried respiration accompanies fever of every description, whether in consumptive patients or not. But when a healthy person is resting, his inspiratory acts are gentle and expand the air-cells of his lungs to but a small extent of their possible dimensions. Deep inspirations would be quite useless, as under such circumstances the tissues take up but little oxygen, and give out but little carbonic acid. If, however, a part of the lung be destroyed, or the air-cells blocked up, then the healthy air-cells remaining must be more widely distended in order to admit the same, or nearly the same, quantity of air to the blood as was admitted by the entire healthy lung. This is done, not by hurrying the respiration, but by making each act of inspiration more profound.

It is true, however, that exertion quickens respiration in consumptive patients much more than it does in healthy persons; and this is equally intelligible. Exertion, even in the healthy, causes acceleration of breathing, in order that the exchange of gases between the air and the blood may take place with sufficient rapidity to supply the increase of oxygen required, and to remove the increased amount of carbonic acid produced by the active body. It is clear, then, that the capacity of the consumptive lung being less than that of the healthy organ, the acceleration of respiration produced by exertion must be more marked in phthisical patients.

The existence of consumption is more likely to be overlooked in children than in adults, as the symptoms which usually distinctly characterise the disease in grown-up persons are much less well marked in children. They suffer comparatively little from cough or night sweats; the cough is dry, and more frequent than distressing; and excessive sweating, if present at all, is usually limited to the head, face, and neck, and does not, as in the adult, drench the whole body. Spitting of blood, too, is exceedingly rare.

The most striking symptoms of phthisis in the child, apart from the signs obtainable by physical examination of the chest, are his listlessness and indifference to former sources of amusement, frequent dry cough, dryness and heat of the skin, and shrivelled lips. These symptoms often come on so gradually that they are frequently entirely overlooked by careless parents; and not uncommonly are they taken as indications of other disorders, such as typhoid fever, by careless or unskilful medical practitioners.

The stethoscopic examination of children is less trustworthy as affording information of the state of the lung than it is in adults. This is due to the fact that the glands surrounding the bronchial tubes being frequently enlarged by inflammatory change, thus come into contact with the walls of the chest, and transmit the sounds made by the larger divisions of the bronchial tubes, which may easily be mistaken for the coarse sounds heard when the lung tissue itself is solidified. Still, careful examination by gentle percussion of the chest, as well as by means of the stethoscope, can do much towards disclosing the actual state of matters in the lungs of children, which often, indeed generally, seems much more serious than is the fact.

In the former chapter it was said that ulceration of the lung, however produced, was followed by the general wasting and other symptoms characteristic of phthisis, and that inflammation of any part of the lung or respiratory passages might lead to this disease. We will now try to make plain the symptoms by which we know that simple inflammatory processes, such as acute or chronic pneumonia and bronchitis, have merged into phthisis.

If acute pneumonia occurs in a strong person, who has hitherto enjoyed good health, the local affection will probably be small in extent, and it will almost always rapidly run a favourable course, and disappear without any special medical treatment, if the patient be simply kept at rest in bed in a cool, well-ventilated room, and supplied with a sufficiency of easily digestible food. But acute pneumonia, when it attacks a person of naturally weak constitution, or one whose constitution has been enfeebled by insufficient nourishment, over-work, anxiety, sorrow, excesses of any description, previous disease, &c., is a much more formidable foe. In such a case the feverish symptoms, instead of subsiding on the fifth or sixth day from the commencement of the attack, are apt to continue and increase in violence. Appetite then disappears; the patient lacks strength to expectorate the matter which fills the air-cells of his lungs; and he dies either from exhaustion, or from suffocation caused by air not being admitted to bathe the minute blood-vessels which line the air-cells.

This, of course, is the most unfortunate manner in which pneumonia ends. It has, however, other serious modes of termination, among which are the passing into acute and chronic phthisis, with which alone we are at present concerned.

We have reason to fear that consumption is being superadded to acute pneumonia when the febrile symptoms continue well marked up to the eighth or ninth day of illness, and then begin to show daily remissions towards morning after shivering and exhausting perspiration. Indeed, such symptoms are all but positive proof of ulceration of the lung having taken place, and, if unskilfully treated, the unmistakable nature of the disease is soon made manifest. Should it run an acute course, and be inefficiently treated, it is almost invariably fatal within a few days or weeks; and often the most skilful medical care is powerless for good in such cases.

More generally, however, the disease progresses slowly, and is then highly amenable to treatment.

The larger the part of the lung involved in the inflammatory change known as pneumonia, the more likely is consumption to supervene either in the acute or chronic form. If the tissues of the greater part of one or both lungs have been saturated with inflammatory matter, there is less likelihood of this being completely absorbed than if the inflammation have been limited to but a small patch. And thus, even when a patient seems to shake off an attack of pneumonia that has affected a large part of either or both lungs, and appears to regain perfect health, there is no small probability that some portion of the substance which infiltrated the lung tissues when actively diseased has not been reabsorbed, but has shrivelled up and undergone the imperfect fatty degeneration which is distinguished as cheesy change, or "caseation," and that a considerable number of the air-cells may have been completely blocked up, and their network of blood-vessels obliterated by this cheesy matter. Nevertheless, as has been said before, a man cannot with accuracy be said to be suffering from consumption even though a considerable portion of his lung be consolidated by substance of this description, unless, of course, he be suffering from symptoms which warrant the conclusion that ulceration is in progress. The consolidated portion may shrink to a very small bulk, and be sharply kept off from the healthy parts by a capsule of tough fibrous tissue; and although on examination the lung can be detected to have been at one time the subject of actively destructive disease, the patient may be consoled with the assurance that if he will pay proper attention to his general health, the probability is in favour of his being troubled no more with serious lung symptoms.

Not unfrequently consumption comes on in persons who have suffered for years from chronic bronchitis, or winter cough. This may happen suddenly, being ushered in by high fever, cough with copious bloody expectoration, loss of appetite, and rapid wasting; or more frequently, perhaps, the serious change is gradual. The feverish symptoms are so slight as to escape the attention of the patient, and even of the physician whose delicacy of touch is so great that he regards his hand as the best thermometer; and suspicion is not fairly aroused until the patient's loss of flesh and pallid countenance are remarked by some friend who has not seen him for some time previously.

It is not upon inflammations of the lungs and bronchial tubes alone that phthisis is apt to supervene. Chronic inflammation of the larynx, brought on by excessive straining of the voice, frequently proceeds to ulceration; and when this takes place we must regard it as a most grave symptom, and exceedingly likely to be followed by ulceration of the lung—that is, consumption.

CHAPTER III.

INTERNAL, CONSTITUTIONAL, OR PREDISPOSING CAUSES OF CONSUMPTION.

WHAT are the causes of consumption? We stand face to face with a disease that, in our own land, kills at least every tenth person, and in some others not less than a fourth of the total population. Can we not discover the conditions on which this awful scourge depends, and, knowing them, correct such as are internal, and avoid such as attack us from without? Why is it that inflammation of the lung is to one man a trifle, and to another the first step in the development of a disease which hurries him more or less rapidly to his grave?

The causes of consumption may be divided into—

1. Such as exist within the body—constitutional or predisposing causes.
2. External or exciting causes.

In this chapter we will consider the first class of these causes only.

There are two constitutional types which peculiarly predispose to consumption. These are—

1. The simple consumptive or phthisical habit.
2. The scrofulous habit.

These two constitutional types have been held by many medical men to be incapable of distinction from each other, and, by such, consumption is regarded as always and only a manifestation of scrofula. This view, however, is borne out neither by facts nor by the ordinary usage of language.

The simply phthisical habit of body is characterised by a long neck and a flat narrow chest which is so long that the volume of the lungs more than makes up in length what it lacks in depth. The spaces between the ribs, especially between the upper ones, are wide; the collar bones project on each side; and the shoulder blades, instead of lying flat against the back of the chest, project in a wing-like manner. The body generally is thin and the muscles soft and flabby.

It is not pretended that every person of the phthisical habit of body will necessarily die of phthisis; yet there can be no question that such persons do show a peculiar liability to this disease. Causes which are quite inadequate to produce consumption in persons of healthy constitutional type prove amply sufficient to arouse the disease in persons characterised by the phthisical habit of body.

Just as phthisis is one thing and the phthisical constitution another; so, too, the scrofulous constitution and actual scrofula (or scrofulous disease) must not be confounded with each other.

Though no positive disease be present, medical men are sometimes quite warranted in concluding that a person is of the scrofulous habit of body, judging from his general aspect, which may be of two very different types—one the so-called "sanguine," the other the "lymphatic."

The sanguine type of the scrofulous constitution is distinguished by a clear transparent complexion, which may be dark, but is usually brilliantly fair; the eyes are fringed with long silky lashes, and are large and liquid, being blue or dark according as the complexion is fair or dark. The hair is thin and fine; the features are usually elegant, though sometimes the lips are puffy and the nostrils wide and dilated. The intellectual faculties are generally precocious, though not invariably so. Two other signs are commonly given as characterising this type of the scrofulous habit. These are, clubby joints, and broad flat finger nails curved over the ends of the fingers. But my own experience is not corroborative of these last. On the contrary, I have remarked in the large majority of cases of unquestionable sanguine scrofulous constitution (as proved either by the actual presence or by the subsequent outbreak of genuine scrofulous disease) that the small joints, at least, are far from presenting a clubby appearance, the fingers being beautifully tapered, with elegantly convex nails not at all curved over the finger tips, except when the patient is emaciated. To these signs must be added a rosy complexion, which, however, easily becomes dark or livid under the influence of cold.

Among the numerous characteristics of the sanguine scrofulous habit, none have appeared to me to be so invariably present as the delicate clearness of complexion, whether dark or fair.

The lymphatic type of the scrofulous habit is characterised by a muddy complexion, broad flat nose, coarse hair and skin, the latter often being thickly covered with down, clubby joints, and usually dull intellectual powers.

A distinctly characteristic specimen of this type is certainly less frequently to be met with than one of the sanguine type. Not unfrequently, however, do we find the two blended in various proportions in the same individual.

It seems strange that the phthisical and scrofulous habits of body should ever have been classed as one; or, rather, that the scrofulous constitution should have been considered the only one which specially predisposed to phthisis. This is doubtless due, in part at least, to the fact that the two habits of body are not unfrequently seen in the same person, and to the general experience of consumption being a disease which frequently appears in families markedly distinguished as scrofulous.

As both the scrofulous constitution and actual scrofulous disease are powerful predisposing causes of consumption, it will be well to describe a little in detail the essential nature of this habit of body and the diseases characteristic of it.

Whatever be the general aspect of a person, we are warranted in pronouncing him scrofulous if he is distinguished by—

1. Great proneness to putrefaction of the secretions.

2. A disposition to the development of low types of tissue.

3. Sluggishness of the absorbents.

Let us see how these operate to the detriment of the individual.

A person of healthy constitution gets a scratch or a cut ; it bleeds a little ; the blood dries up, forming a scab, which drops off in a few days; and the wound is healed. But should a similar injury be inflicted on a person of scrofulous habit, it is not unlikely that, instead of a scab being formed, a thin offensive serum will exude from the wound, which soon becomes purulent; and thus a suppurating sore is established. Here, in the offensive character of the discharge, there is evidence of putrefaction ; we next have the tendency to the development of low types of tissue seen in the formation of pus ; and lastly, we may see from the thickened edges of the sore that the absorbents are far from active in carrying off the products of inflammation.

Let us next compare the effects of sore throat in individuals respectively of sound and scrofulous constitution. In the former, as in the latter, the glands surrounding the bronchial tubes are apt to be sympathetically inflamed ; but in the former the inflammatory lymph which has been infiltrated into the substance of the glands is soon reabsorbed after the throat gets well ; while, in the scrofulous individual, there is great probability that such a favourable result will not take place. The inflammatory lymph, instead of being completely reabsorbed, is apt to dry up and undergo the cheesy transformation before described; and if the cheesy matter thus formed should make its way in the form of minute fragments into the general circulation, they will be deposited throughout the body and especially in the lungs. The little particles of degenerated lymph act as so many centres of mechanical irritation; and thus are produced inflammation, ulceration, and suppuration, with their natural constitutional accompaniments, hectic fever and rapid general wasting.

What has just been described is acute miliary tuberculosis; and this is the only form of consumption to which the term "tubercular" can be applied with propriety. But it is not the only form of consumption to which the scrofulous are peculiarly liable. Such persons, in common with all others, are liable to ulceration of the lungs as a result of simple inflammation; but in them the ulcer of the lung shows the same difficulty of healing as do external sores, and hectic fever is readily set up.

It is familiar to all that the scrofulous constitution is often handed from parent to child; indeed, people generally speak as if they believed that it could be inherited only, never acquired, and never lost. No greater and more pernicious delusion exists. Like flocks and herds, silver and gold, it may be inherited; like them, too, it may be acquired; and, fortunately, like them it may be lost. I have said that the contrary belief is a pernicious delusion, and I say so advisedly, because such a belief induces those of vigorous constitution to take liberties with themselves which soon generate scrofula or the scrofulous habit either in themselves or in their offspring, and leads the scrofulous to neglect the means by which this morbid disposition might be eradicated. It cannot be too strongly maintained that whatever tends to impair the general health tends to develop the scrofulous constitution ; and, *vice versâ,* that the scrofulous constitution may be mitigated or entirely shaken off by care and attention to the means of improving the general health.

Ulceration of the lung, however, and the consequent general symptoms of consumption may take place in those who have been up to that time in good health and in whom not the slightest sign either of the phthisical or scrofulous habit of body has been manifested. Strong, healthy people may, especially when temporarily exhausted, contract an attack of bronchitis or pneumonia which, from simple inflammation, goes on to ulceration ; and when this has been accomplished, the typical symptoms of consumption soon make themselves manifest. Or the same train of symptoms may follow on the rupture of a small blood-vessel caused by over-exertion. Here there is great danger that some of the effused blood may remain in a clotted condition in the lung, that it may then dry up and act as a mechanical irritant, thus giving rise to ulceration. There is ample proof on record that consumption will result from simple ulceration of the lung, however produced. With respect to the disease following on the rupture of a blood-vessel in a person to all appearance previously in perfect health, it may be said that the very fact of the blood-vessel bursting is a proof that the lung was diseased at that time. There are, however, numerous instances on record in which the disease was clearly caused by a solid body being drawn into the windpipe and lodging in the lung; and such cases should satisfy any one that ulceration of the lung, pure and simple, is adequate to produce true pulmonary consumption with all its typical signs.

In addition to what has been said on the signs of the scrofulous habit, it may be well shortly to describe its principal morbid manifestations, or true scrofulous disease.

The scrofulous constitution can scarcely exist in a child without its being detected by a careful medical attendant, either by the breaking out of skin eruptions without an apparently adequate exciting cause, by sores festering instead of healing kindly, or by glandular swellings of an indolent character—that is, neither quickly subsiding nor quickly going on to suppuration and discharge. Small abscesses also frequently form just under the skin, generally in the arms and legs, and occasionally under the scalp. These first appear as hard lumps free from tenderness, over which the skin is not movable ; next, they slowly soften ; and finally, they break and discharge. The sluggish manner in which change goes on in the scrofulous body is well exemplified by those little abscesses. They soften slowly, and even when they have projected above the level of the surrounding skin, the skin immediately over them seldom exhibits redness until several days have elapsed, and it becomes as thin as paper over a considerable surface before an opening forms for discharge. How different this is from the course run by a boil (which is simply a cutaneous abscess) in a person of good constitution. In this case the hardness under the skin is tender ; it softens quickly, points, discharges, and is healed in a few days instead of in the many weeks that a scrofulous abscess takes to run its sluggish course.

Indolent swelling of the glands in the neck and under the jaw are among the most frequent of scrofulous affections. They are especially prone to come on during the presence of eruptions of the head and face, after or during coughs, colds, attacks of measles, scarlatina, or hooping-cough—indeed, as the result of any debilitating influence. Often a whole group of those glands is affected simultaneously, causing great disfigurement by the thickening of the neck thus produced. Indeed, it is this thick pig-like neck that has given rise to the term "scrofula," the word being derived from the Latin *scrofa*, a sow.

Chronic inflammation of the eyelids and perpetual cold in the head are two symptoms frequently seen in persons of the scrofulous habit; and the discharge from the nostrils is, in many cases, of a most offensive odour, constituting what is known to medical men as "ozaena."

Another manifestation of the scrofulous habit, which is not only disgusting but most obstinate if left to unaided nature to mar or mend, is discharge from the ear, or "otorrhœa." But not only is this affection disgusting, filthy, and obstinate; it is almost invariably accompanied by deafness which, at first slight, may become almost complete, and which in all probability will be permanent if the discharge be not quickly arrested. Even after it has entirely ceased it will often break out again and again, and can be permanently cured only by improvement of the general health—that is to say, by cure of the scrofulous habit.

Let us here say a few words on the subject of acquired scrofula. Repeated observations have established the fact that in children who were born healthy and of healthy parents, and who have remained so while being nursed either by their mothers or good wet-nurses, the diseases recognised as scrofulous have developed themselves shortly after cow's milk and farinaceous food have been used as substitutes either in whole or in part. It would be well if parents would remember that at all ages, but especially in childhood, improper food is even more pernicious in its influence on the constitution than an insufficiency of food which is of suitable quality. A supply of proper food greatly insufficient will, of course, soon be followed by death from starvation ; but if it be only slightly deficient in quantity the worst results will be stunted growth and small power of resisting hurtful influences. Improper food, on the other hand, even though it enter to but a small extent into an otherwise good dietary, will produce positive disease which in children is peculiarly liable to assume the scrofulous type. Persons in whom this constitution has been developed, not inherited, seldom present very distinctly any one of the features mentioned as characterising it ; but they give ample evidence of the taint either when injured or when attacked by disease.

To sum up upon the subject of scrofula, it may be admitted that a perfect definition of this constitutional habit cannot be given in the present state of medical science, but that it appears to consist mainly in a perversion of nutrition distinguished by the three characters previously mentioned, namely, great proneness to putrefaction of the secretions, disposition to the development of low types of tissue, and sluggishness of the absorbents; that, apart from the danger of acute miliary tuberculosis being produced by the absorption of minute particles of the cheesy matter which is so frequently present in glands that have been affected with scrofulous inflammation, the depraved state of nutrition renders difficult the healing of ulcerated lung tissue and the absorption of inflammatory products in the lungs as well as in any other parts of the body; and that, therefore, be this constitutional habit inherited or be it acquired, it is one which peculiarly predisposes to consumption.

We must now turn to the consideration of the simply consumptive or phthisical habit of body.

From time immemorial physicians have remarked the peculiar liability to consumption of persons distinguished by long necks, flat, long, shallow chests, with wide hollow spaces between the ribs, and projecting collar bones and shoulder blades.

Rokitansky, the great Austrian pathologist, first showed that these external characters were associated with internal deviations from normal structure of a most striking kind, namely, small weak heart and main blood-vessels, and bulky lungs. But it is not sufficient to tell us that phthisis is frequently associated with certain peculiarities of bodily structure. The question still remains to be answered—Why should this be so? Rokitansky, however, founded no theory upon his valuable record of facts. He proved the concurrence of the external characters significant of the phthisical habit with smallness and delicacy of the heart and large lungs; but he did not venture to submit that phthisis was to be scientifically accounted for by these inner, any more than by the outer peculiarities of structure.

It was reserved for Dr Brehmer of Görbersdorf to show that these anatomical peculiarities were of themselves adequate to explain the frequency with which phthisis is developed in persons presenting them. In his treatise on the "Laws and Curability of Chronic Tuberculosis of the Lungs" (*Die Gesetze und die Heilbarkeit der Chronischen Tuberculose der Lunge*, Berlin, 1856), after pointing out that the exudation which blocks up the air-cells in the phthisical lung differs from the exudation in simple inflammatory affections in no anatomical particular, but merely in its either being not at all or only incompletely absorbed, Dr Brehmer shows that this is due to the fact that in phthisis new attacks of inflammation are perpetually invading the lung in parts previously healthy, in a direction generally proceeding from the summit to the base, and that consequently the capillary blood-vessels in the region of the exudation are almost constantly in a state of congestion and therefore incapable of reabsorbing the inflammatory matter already exuded. If, then, we can answer the questions —Why and under what circumstances are certain individuals more disposed than others to chronic inflammatory affections of the lungs?—why is the left lung more subject to such attacks than the right?—and why particular parts of the organs more than others?—we shall have solved the problem of the causation of phthisis. This leads us to seek for a clue to the solution of this problem in the phenomena of inflammation; and we find that this process is essentially characterised by the flow of blood in the capillary vessels of the affected part becoming gradually more retarded until it ceases entirely. In this stagnant condition of the capillary circulation, not only is absorption impossible, or at least much diminished in activity, but exudation from the minute vessels takes place. This being the case, we are warranted in concluding that the circulation in the lungs of such as are subject to recurrent localised pulmonary inflammation is less rapid than in the lungs of healthy persons. As the morbid process in the consumptive lungs generally attacks the upper part of the left organ first, and next the upper part of the right, before it extends much towards the lower parts, the questions to be solved are reduced to the following :—

1. Why does the blood circulate in the lungs of some men more slowly than in those of others ?

2. Why does the blood flow more slowly in the left lung than in the right, and in the upper parts of both organs more slowly than in the lower parts ?

To answer these questions, the conditions which regulate the flow of liquids in tubes must be considered.

The rate of flow of a liquid is dependent—

1. On the moving force.

2. On the channels in which it flows.

In reference to these conditions the following three propositions are self-evidently true :—

1. The greater the force by which a liquid is set in motion within a system of tubes, the greater will be the rapidity of its flow, the condition of the tubes remaining the same.

2. The more uniform the channels be in every respect, the less will be the loss of force during the

passage of a liquid through them, and the greater will be its velocity.

3. The greater the number of the subdivisions into which a main channel divides, the less will be the velocity with which a liquid flows through them when impelled by the same force.

A more sluggish flow of liquid in a system of canals, we thus see, may depend—

1. On diminished moving force.
2. On increase of the subdivisions of the main channel.
3. On the operation of both these causes.

These principles, applied to the flow of blood in the blood-vessels, teach us that the blood will circulate slowly within the lungs—

1. If the impulse of the heart be weak.
2. If the network of capillary vessels be unusually extensive.
3. If at once the heart be weak and the capillary network unusually extensive.

These conditions we have seen to exist in persons characterised by the phthisical habit of body, and they are amply sufficient to account for the great liability of such persons to pulmonary inflammation.

If consumption is, as no one denies, a disease which essentially consists in waste of the body in general and of the lungs in particular, we can see how completely it is to be accounted for by the co-existence of a small weak heart and bulky lungs. It is admitted on all sides that the blood is the fluid by which nourishment is supplied to every part of the body; and it is clear that a heart with small chambers and weak muscular walls must propel less blood at each contraction, and this with less force than an organ with large chambers and thick strong walls; and that therefore the body of a person who has such a small weak heart will be less well nourished than that of one whose heart is of the average size and strength. It is no less evident that the lungs will be the first organs to suffer from the inadequate supply of nourishment, if they be—as they are in persons of phthisical habit—large in proportion to the other organs of the body.

But as comparatively few phthisical patients are characterised by the peculiarities of structure known as the phthisical habit, the question as to the cause of phthisis in the large majority of patients still remains to be answered. The essential principle of causation is, however, the same in each class of sufferers, namely, diminished and retarded supply of blood to the lungs and body generally.

It was never maintained by Dr Brehmer that the only cause of phthisis is smallness of the heart and main blood-vessels in association with unusual largeness of the lungs, though some of his detractors would fain have us believe so. Being well aware that these characters were to be seen only in persons of the phthisical habit, who form but a small proportion of all sufferers from consumption, it was in them only that he maintained the direct dependence of the disease on those structural abnormalities, as may be seen by any one who will take the trouble to refer to his works on the subject. He there repeatedly states that the phthisical habit is only to be seen in 9 or 10 per cent. of consumptive patients, and that whatever occasions long-continued or permanent retardation of nutrition tends to induce chronic pulmonary consumption, this disease being essentially but the expression of retarded nutrition of the whole body. Nevertheless, we find that Dr Schreiber of Aussee, at pp. 22 and 23 of his little work "On the Nature of Climatic Cures in Sufferers from Lung Disease" (*Ueber das Wesen Klimatischer Kuren bei Lungenkranken*, Wien, 1876), says, "Dr Brehmer has developed the theory that every case of phthisis depends on smallness of the heart and on the defective nutrition of the lungs naturally inseparable from this. . . . . Whoever has occupied himself for a long period with the treatment of consumptive patients, will admit that a not inconsiderable percentage of them possess broad and well-rounded chests."

Any one unacquainted with the writings of Dr Brehmer might readily be led to assume from the above quotations that this physician held phthisis to be a disease only found in persons of the phthisical habit of body; and those quotations are only samples of numerous similar misrepresentations made by his countrymen. In England his works seem to have been almost completely ignored.

It may perhaps be said, that, if only 10 per cent. of consumptive patients are of the phthisical habit, we are not warranted in assuming any relation of cause and effect whatever between this habit of body and the actual disease. This objection would be perfectly sound did we find that persons of the phthisical habit of body bore the same numerical relation to the population generally as they do to sufferers from consumption. But no one will contend that every tenth person he meets is of the phthisical habit, while certainly not less than 10 per cent. of consumptive patients are.

If we examine still more closely into Dr Brehmer's theory of the constitutional or predisposing cause of phthisis, we shall find that it renders intelligible facts previously well known, but of which no satisfactory explanation could be given.

For instance, it has long been a matter of observation that consumption rarely, if ever, attacks persons suffering from enlarged heart or from diseases or malformations of the blood-vessels which lead to increase of the size and force of the heart, and therefore to a more rapid circulation of the blood and accelerated nutrition. On the other hand, it is equally certain that consumption is of very frequent occurrence in persons in whom, either as the result of disease or malformations, there is an obstacle to the free passage of blood from the heart to the lungs.

There are other conditions which have been observed to be incompatible with consumption. Such are goitre (Derbyshire neck) and abdominal tumours; and that these should act as preventives of this disease is equally intelligible on the theory that it essentially depends on languid circulation of the blood, especially in the lungs. The enlarged gland constituting goitre presses on the windpipe and thus reduces the calibre of this tube. The sufferer from this disease is therefore obliged to take more profound inspirations in order to obtain a sufficient supply of air. Now the most evident effect of increased profundity of inspiration is quickened action of the heart and consequent greater rapidity of circulation of the blood both in the lungs and in the body generally.

Similarly, abdominal tumours, by pressing the midriff upwards, squeeze the lungs into a smaller space, rendering necessary increased rapidity of respiration and consequently of circulation. In this case the flow of blood through the minute vessels of the lungs is further quickened by the reduction in their calibre, which is a necessary consequence of the compression to which the organs are subjected.

Additional evidence, corroborative of Dr Brehmer's theory in a marked degree, was obtained by Dr Ferdinand Weber, a military medical officer stationed in the department of Zollkiew in Galicia. Among the Slavonian country people there, and the recruits who passed through his hands before being enrolled in the Austrian army, he found that scrofula was the most prevalent of all constitutional maladies, but that pulmonary consumption was exceedingly rare notwithstanding the predisposition to it which is induced by scrofulous disease. Although indurated glands in the neck, and scars, the results of suppuration and healing, were frequently seen, the experience, not only of Dr Weber, but of the surgeons who had been practising in the district for many years, went to show that phthisis was a disease of the utmost rarity among the Slavonic inhabitants, although the colonists of German blood who had settled there suffered from it not unfrequently. These Slavonians were found to be most inattentive to personal cleanliness, their dwellings were dirty and badly ventilated, and their food chiefly consisted of a poor and slightly nutritious vegetable diet, of which, therefore, large quantities had to be eaten. We have then in this people all the conditions usually regarded as favourable to the development of phthisis, and that these conditions do seriously injure the constitution is proved by the great prevalence of scrofula. But in virtue of the large quantities of the inferior food they consume, the abdomen reaches such an enormous size that the lungs are pressed into a comparatively small space and never attain the dimensions of the lungs of ordinary men. That these abnormally small lungs will be less liable to suffer from inadequate nutrition than the parts of the body which are of normal size stands to reason and is proved by facts. The bodies of these Slavonians resemble in this respect those of children, in whom the abdomen is always proportionally larger than in grown-up persons, and in whom consumption is comparatively rare.

Indeed, by Dr Brehmer's theory may be explained almost every fact that is known about phthisis. That it should be so frequently ushered in by spitting of blood is a natural consequence of the delicate structure of the blood-vessels in persons predisposed to the disease; that it should commonly attack the left lung first is due to the left branch of the pulmonary artery being generally smaller than the right; that it should usually attack the summits of the organs first we can see to be natural, as not only does the blood flow with less ease upwards than downwards or sidewise, but the upper portions of the lungs are less called into play in ordinary respiration than any other parts, and they therefore exercise less attraction upon the blood. There are, moreover, other reasons why the left lung should be the first to suffer from wasting disease, and why the disease should attack the upper part of the organ first. The conical summits of the lungs lie among loose yielding tissues, and therefore meet with but little resistance to inflation. But, during each act of inspiration, considerable resistance is offered to the expansion of the other parts of the lungs—at the sides by the ribs, and below by the midriff and abdominal organs. This resistance to the expansion of the bases of the lungs is greater on the right than on the left side, and is due to the right half of the midriff being attached higher up on the left side and having the liver situated immediately below it. The natural consequences of this resistance are compression of the lung substance and narrowing of the calibre of its capillary blood-vessels, through which, therefore, the blood rushes with increased velocity. On expiration, the pressure is taken off the lung substance, and the capillary blood-vessels then expand and forcibly suck in the blood from the branches of the pulmonary artery.

We see, then, how this intermittent pressure, to which the base of each lung is subjected, but especially that of the right, accelerates circulation in those parts in a twofold manner: during inspiration, by the reduced calibre of the minute vessels; during expiration, by their expansion and consequent suction force on the blood. It is plain, of course, that this acceleration of pulmonary circulation, caused by the intermittent resistance to expansion of the basal portions of the lungs, must gradually diminish from below upwards; and thus we see how, upon physical principles, is rendered intelligible the general order in which the parts of the lungs are affected by wasting disease, namely, first the left summit, next the right summit, and finally the lower portions.

Formerly, there was a very general belief among medical men that intermittent fever (or ague) was a disease which conferred immunity from consumption on those who had suffered from it; and some even went so far as to maintain that malaria, the reputed but unknown cause of ague, was a preventive of consumption. These doctrines, though long since shown to be inaccurate, seem still to obtain credence with some medical men, of whom more than one has expressed to me his astonishment when I have mentioned to him the prevalence both of phthisis and malarial fevers in Siam. But, although incorrect, the belief that malaria was antagonistic to phthisis seemed to be justified by facts. It was not pretended that in aguish districts consumption was absolutely unknown; but it was unquestionably shown to be almost, if not quite, absent from many such localities, and to be less prevalent where the fever was of a bad and obstinate type than where it was mild. In Upper Silesia, for instance, although Professor Virchow visited large numbers of the sick, he found no case of phthisis either in town or country, in private houses or in hospitals; and he was assured by the medical practitioners resident there that this was the result of their experience also. But what Professor Virchow did find in this part of the country was that almost every person he met had suffered more or less from ague, and that in most of them, as the consequence of this disease, the spleen had become considerably enlarged.

Here, then, in the enlarged spleen of those who have suffered from obstinate ague, we have a sufficient explanation of their comparative immunity from phthisis, by the accelerating influence it exercises on the circulation within the lungs, as a result of the intermittent compression to which the bases of the lungs are subjected by this, in common with all other enlargements of the contents of the abdomen.

If the spleen be greatly enlarged, the resistance it offers to the expansion of the base of the left lung is greater than that offered to the expansion of the right lung by the liver and the highly attached right half of the midriff. Now, when phthisis does occur in persons suffering from enlargement of the spleen, the right lung is almost invariably the first to suffer, thus affording another illustration in favour of Dr Brehmer's theory of its causation. Having practised for many years in a malarious district, I have myself attended numerous patients suffering at once from consumption and enlarged spleen; but I have not seen one such case in which the right lung was not the first to be attacked.

It need scarcely be said that the influence of marriage in preventing or checking consumption in women is intelligible on the same principles; that at most it has but a temporary influence; and that of themselves the bearing and suckling of children naturally lead to exhaustion of the system, and ultimate greater predisposition to phthisis than that before existing. That women who have suffered from unmistakable consumptive disease do often shake it off after marrying and having children, I fully admit; but, apart from the accelerated circulation in the lungs effected by the hindrance to expansion of their lower parts which exists for a few months previous to the birth of a child, any further benefit derived by a consumptive woman from marriage must be looked for in the increased bodily activity involved in the care of her children or in improvement of circumstances enabling her to obtain more change of air and better food than she could when single.

We can now see also why it is that consumption, although no period of life is absolutely exempt from it, so comparatively seldom supervenes before the approach of adult age, even in those strongly predisposed to it. In infancy and childhood, the natural great rapidity with which the heart beats enables even a weak organ to supply a quantity of blood to the lungs sufficient to maintain them in a fairly healthy condition. But the rate of pulsation of the heart gradually diminishes in frequency with advancing years, and the lungs that received only sufficient nourishment in childhood will obtain a very inadequate supply in early manhood.

Enough has now been said to satisfy most, if not all, unprejudiced readers, that the constitutional condition on which consumption depends is languid circulation of the blood, especially in the lungs; that this languid circulation we find accounted for by the existence of an abnormally small heart and abnormally large lungs in those known to be predisposed to the disease from birth, in virtue of their external bodily configuration or phthisical habit; and that the conditions which have long been recognised as protective against consumption are those in which either the size and force of the heart are increased, or in which, by other means, the circulation in the lungs is accelerated.

Now, as inflammation is the great instrument of destruction in the consumptive lung, it may be well to describe the connection that exists between inflammation and deficient blood supply; and this is the more necessary, as the general impression is that inflammation is inseparably connected with excessive supply of blood to the affected part. This view is, moreover, that which was formerly held by the medical profession, and it would seem at first sight to have much in its favour.

As this is a most important subject, it will be well worth the pains to study the process of inflammation a little in detail. This we can do nowhere better than in the membrane which covers the eyeball and lines the eyelids, as we have here a transparent tissue in which we can observe almost all the stages through which inflammation passes, from the moment of its being aroused to its termination either in recovery or ulceration.

Let us suppose a grain of pepper or some other irritant to be applied to the eye. The immediately evident results are acute burning pain, copious discharge of tears, and inability to bear the usual amount of light. That is to say, the functions of the eye and of the lachrymal gland have been increased in activity. If our organs are in a state of perfect health we can scarcely be said to be conscious of their existence; but an inflamed eye excites most painfully the attention even of the most apathetic. The fluid which covers the surface of the healthy eye is small in amount, and of a slippery, oily consistence, permitting the eyelids to glide smoothly over the ball; whereas the tears that gush from the injured eye are large in quantity, and thin and watery in quality. They are, moreover, no longer bland and unirritating, as is proved by the excoriated cheeks of patients who have suffered from inflamed eyes for any considerable length of time. Lastly, while an eye that has been injured and inflamed is greatly more pained by strong light than an uninjured eye, it nevertheless affords much less distinct images of surrounding objects. The sufferer himself is conscious of the just described results of injury to the healthy eye; but additional effects are also produced which are more evident to onlookers. Let us see what these are.

The most superficial observation will detect that the inflamed eye is redder than the other. If it be more carefully compared with the healthy organ, it will be seen that its visible blood-vessels are greater in number and larger in size. Close observation will also detect swelling of the thin membrane which covers the front of the eyeball, and is prolonged forwards from above and below to line the back of the eyelids. If the observer will next lay his fingers on the shut lids of the two eyes, he will find that the injured organ is the hotter; and if he have not performed this last act with great gentleness, he will probably elicit yet another fact, namely, that it is the more tender of the two, as the patient will complain that he has aggravated the pain in the inflamed eye.

Were the eye not an organ of such extreme sensitiveness, it might be shown that the distended vessels to which the redness is due could not be emptied by pressure being applied over them—that, in fact, the blood is stagnant within them.

Inflammation, indeed, is essentially a process in which the passage of the blood through the capillary vessels is obstructed. Early in the process these are gorged with stagnant blood; and when the blood stagnates within any organ or part of an organ, the result is that the lower elements of structure grow at the expense of the higher. As is proved by the increase of temperature, change is really more active in inflamed parts than in those in which the circulation is normal; but the change is different in kind. In the healthy organs the tissues are constantly being wasted, dying, it may be said, in the performance of their functions; but they die particle by particle, and repair goes on hand in hand with waste. Now, after stagnation of blood in the capillary blood-vessels, one of the most striking phenomena of inflammation is *suppuration;* and this may be said to consist essentially in excessive multiplication of the colourless corpuscles of the blood. These ooze through the delicate walls of the vessels, and increase and multiply at the expense of the fully-formed tissues outside, the actively-growing parts of which break up into bodies similiar in appearance to the colourless blood corpuscles, and, like them, multiply rapidly. Vital activity is greater than in health; but it is the increased vital activity of anarchy. The structural elements, instead of co-operating for the general welfare of the organism, enter into keen competition with each other. Now, we all know that the simpler the structure of any organism in the animal or vegetable world, the more tenacious it is of life, and the more easily it is nourished and multiplies its kind; and this is equally true of the elementary parts of the human body. If the supply of nourishment be cut off from a limb or any other organ, stagnation of blood first takes place; next, active growth of the colourless corpuscles of the blood, or suppuration, this taking place at the expense of the higher structures; and, finally, ulceration or gangrene.

Not until this stage has been reached do we clearly see how essentially wasteful inflammation is, and how the minute vessels of the inflamed part must have ceased to act as channels for the transmission of blood. Were this latter not so, it is plain that all ulcerative processes would be attended with bleeding, and we know that this is not the case—that, for instance, a consumptive patient may die after complete destruction of large portions of both lungs, without having on a single occasion shown a trace of blood in his expectoration.

But it has been asserted, and it meets with general belief, that local abstraction of blood is of benefit in inflammation ; and it may rightly be asked if this fact does not afford complete refutation of the theory that the circulation in an inflamed part is obstructed. Now, I not only fully admit, but I strongly maintain, the value of small local bleedings in a certain stage of inflammation and in certain persons, but in a certain stage only ; and the benefit derived from such bleedings is perfectly intelligible, though one of the earliest characteristics of inflammation is stagnation of the capillary system, or congestion. Granting this, two things will be evident to us—first, that the distended vessels filled with stagnant blood must be productive of injury to the tissues between them by subjecting them to abnormal pressure ; and, second, that the circulation in the vessels in the neighbourhood of the inflamed part will be more active than before, seeing that in the inflamed part the capillary vessels no longer perform their share of duty in relieving the arteries of their charge of blood. To this, and to the fact that the nerves of an inflamed part are rendered tender by the pressure exercised on them by the distended vessels, is to be ascribed the throbbing pain we feel in a part that has just been cut or otherwise injured.

Under such circumstances it is evident that decided benefit may be obtained by abstraction of blood either directly from the congested capillary vessels or from the veins in their neighbourhood; and we can understand how consumptive patients often express a feeling of relief and lessened oppression after bringing up a few mouthfuls of blood from the lungs. But the relief thus obtained is not an unalloyed blessing. The consumptive patient has need of every drop of blood in his body; and bleeding is a most wasteful mode of relieving congestion.

Perhaps as much as is necessary has now been said on the subject of inherited constitutional predisposition to phthisis; but it may be well to answer an objection to Dr Brehmer's theory which has been advanced to it in Germany, and which may have occurred to some of my readers.

Dr Rohden of Lippspringe, for instance, in his work on "Chronic Pulmonary Consumption" (*Die Chronische Lungenschwindsucht*, Elberfeld, 1867), admits the frequency with which smallness of the heart and weakness of its walls are found in the bodies of consumptive patients; but he alleges that these are characteristic, not of consumption alone, but of it in common with every other wasting disease, and that they are to be regarded for the most part as the consequences, not the causes, of the ailment. That is to say, in diseases of this description, the heart shares in the general weakness and dwindles in size as a consequence of diminished action.

Now it is certainly true that weakness and flabbiness of the walls of the heart are among the consequences of all diseases distinguished by long-continued muscular wasting ; and the heart of a patient who has died from consumption may be expected to have got into that state as an effect of the disease. But in the bodies of persons of the consumptive habit, whether they have died from that disease or not, it is not merely the heart as a whole that has been noticed to be diminished in size,—its chambers also are smaller than those of the normal heart in a most marked degree, having sometimes only two-thirds or even only a half of the usual capacity.

It will scarcely be maintained that this diminution in capacity can be accounted for by the theory that diminished action has led to it. Just as disuse of any muscular organ is followed by dwindling, so diminished action of the heart must certainly lead to thinness or flabbiness of its muscular walls ; but on no principle, either physical or physiological, can we ascribe diminution in the capacity of a hollow muscular organ to diminished action of its walls; and, as a matter of fact, in wasting diseases other than consumption, the size of the heart is scarcely diminished at all, but its walls are simply rendered soft and flabby.

CHAPTER IV.

EXTERNAL OR EXCITING CAUSES OF CONSUMPTION.

WE must now take into consideration the circumstances which have been thought by many to be the essential and direct causes of phthisis—namely, external influences which exercise a prejudicial effect upon the constitution.

A careful examination of these circumstances will, I think, lead us to the conclusion that one class only of them can be regarded as directly productive of consumption ; that the others must be regarded as indirect or exciting causes only ; and that these act by inducing either general languor of the circulation or deterioration in the quality of the blood. The one class of external influences which of themselves are competent to produce consumption is that which consists in mechanical irritants which gain access to the lungs and respiratory passages. It has been said before that a cherry stone dropping into the windpipe and lodging in one of the bronchial tubes is amply sufficient to induce all the general and local disturbances of nutrition which go to make up consumption; and any other solid bodies, which, though small in size, are of a hard and irritating nature, are equally competent to do the same. Dry-grinders of steel instruments, stone-masons, and quarrymen, all of whom work in an atmosphere laden with irritating particles of metal or stone, have always fallen victims in large numbers to consumption.

Among the second class of external influences, some of which have been regarded as direct causes of consumption, but which are really means by which the predisposition to it is acquired, or by which the disease is excited in those already predisposed to it, are—bad or insufficient food, impure air, sedentary employment or insufficient exercise, anxiety or depression of spirits, residence in a damp locality; to which may be added, weakening influences of every kind, such as excesses, exhausting diseases, long and repeated nursing of children.

That each one of those has great influence in exciting consumption in those predisposed to it, and even of causing such debility as may in itself constitute a predisposition to the disease, admits of no doubt; and it is evident that this is more likely to happen in proportion to the number of those pernicious influences which act on the constitution at the same time.

Improper food, as a means of engendering scrofula and the scrofulous habit, has already been alluded to; and I do not think it has ever been pretended that it acts as a cause of consumption otherwise than indirectly—that is, either by inducing scrofula or by rendering the constitution less capable of resisting influences unfavourable to health. But, though scrofulous people are peculiarly liable to consumption, we have already seen that, among the Slavonic residents of the Galician district of Zolkiew, scrofula is rampant, and yet that consumption is of the very rarest occurrence. We also saw that the predisposing influence of scrofula was nullified in this people by conditions existing within the bodies of those suffering from it.

A supply of food but slightly insufficient will unquestionably render a person who is already predisposed to consumption still more so, and may perhaps engender this predisposition by producing general weakness. But when the supply of food is greatly inadequate for the proper nourishment of the body, the effect produced is not consumption, but famine fever.

That the breathing of air polluted by emanations from our own lungs and skin or those of others is generally sufficient to lead to the development of phthisis is perfectly certain; but this cause of the disease seldom acts alone, being usually conjoined with another—namely, sedentary employment or deficient exercise. Still, the influence produced by rebreathed air in exciting scrofula and consumption is perhaps more powerful than that of any other single external cause. Indeed, Dr Mac Cormac of Belfast has promulgated as an absolute law that "wherever the air habitually respired has been respired, in whole or in part, before, there, tubercular deposits are found, and wherever the air habitually respired has not been respired, in whole or in part, before, there, tubercular deposits are impossible, and consumption and scrofula are unknown" ("Consumption," &c., by Henry Mac Cormac, M.D., p. 28, 2d ed., London, 1865). In this work and others on the same subject by Dr Mac Cormac much valuable evidence will be found which proves how powerful is the influence of rebreathed air in giving rise to consumption and scrofula. It must be remembered, however, that when Dr Mac Cormac wrote the works referred to, it was generally believed that consumption was essentially tubercular in its nature.

An instructive experiment was unintentionally performed many years ago, which showed how readily the lower animals also yield to consumption, when compelled to breathe the same air over and over again.

In the Zoological Gardens there were about sixty healthy monkeys, many of which had lived through several winters there in perfect health. The benevolent proprietors of the Gardens took it into their heads to provide those monkeys with a house which might be comfortably warmed so as to secure them against suffering from the cold of an English winter. The windows of this house were made to fit as closely as possible; the room was heated by fires in two ordinary drawing-room grates; and, in addition, warm air was admitted through openings in the floor. An attempt was made to ventilate this room by openings made in the skirting under the floor; it being assumed that the carbonic acid gas expelled from the monkeys' lungs would sink and escape through those openings. Now though carbonic acid gas is heavier bulk for bulk than common air of the same temperature, it is lighter bulk for bulk when it issues in a heated condition from the lungs than common air at the ordinary temperature or at a temperature comfortably warm. In this famous monkey-house, therefore, the foul air from the lungs of the animals, instead of descending and escaping through the holes in the skirting, rose to the ceiling, and gradually became mixed with the general atmosphere of the room. The warm air that was admitted through the openings in the floor passed up the chimneys without carrying the foul air before it. In this comfortably warmed, but vilely ventilated room, fifty out of the sixty monkeys confined in it died within a month; and *post-mortem* examination showed that consumption was the cause of death in every case.

One among the many facts mentioned by Dr Mac Cormac in proof of the pernicious influence of impure air is that even the dry-grinders of steel instruments who pursue their deadly employment in the country reach the average age of forty, while those who work in the confined and impure atmosphere of the Sheffield manufactories mostly die before the age of thirty.

Want of exercise is perhaps not in itself sufficient to excite consumption; but that it powerfully cooperates with prerespired air towards this end is sufficiently shown by the following facts observed by Professor Guy.

In printing offices, compositors and pressmen occupy the same building and often the same room, the one class being thus as unfavourably circumstanced with respect to the atmosphere breathed as the other. The occupation of the compositor is, however, very different from that of the pressman. The former has but to lift his types from his case to his composing stick, while the latter has to perform work involving considerable exertion in screwing and unscrewing the lever of his press as well as in other particulars. And the pressman is rewarded for his harder labour by a liability to consumption only one-half of that suffered by the more unfortunate compositor.

Professor Guy also made the observation that consumption was prevalent among those who worked in badly ventilated rooms in proportion to the foulness of the atmosphere; that the employés in the upper room of a badly ventilated printing office, for instance, where the air that entered was always first contaminated by the exhalations of the workers below, were greatly more subject to consumption than the latter.

It cannot be admitted, however, that the law promulgated by Dr Mac Cormac is absolutely correct. It is exceedingly doubtful if it can be shown that people who habitually breathe pure air ever suffer from consumption, though it has been alleged that the Kalmucks, a nomadic race subject to Russia, form an exception to this rule, dwelling as they do in tents, and for the most part leading an outdoor life. The severe winter to which the Kalmucks are exposed can scarcely fail, however, to keep them confined to their tents during that season; and the air within a tent can be contaminated scarcely less easily than that of an ordinary dwelling-house. The confinement of the Kalmucks to their tents during the winter season may, therefore, be sufficient to account for the prevalence of consumption among them.

There can, however, be no question as to the fact that almost absolute immunity from consumption may exist among those who live for the greater part of the day and night in dwellings the atmosphere of which is absolutely saturated with the emanations from their own bodies and those of their domestic animals. It has already been mentioned that Professor Virchow was unable to find a single case of consumption among the sufferers from famine typhus in Upper Silesia. This circumstance is mentioned in his report published in the second volume of his "Archives of Pathological Anatomy." In this report we find a record of facts which demonstrate that the unhappy people whom Professor Virchow was visiting were entirely free from consumption, and this in spite of residence in a locality with damp soil, in houses filthy, over-crowded, and so badly ventilated that a person unaccustomed to the atmosphere of these hovels began to suffer from headache a few minutes after entering. When we consider, moreover, that the food of this people was so bad and insufficient that famine typhus had broken out, we can see how powerless external circumstances are to produce consumption in persons protected from this disease by conditions existing within their own bodies. It may be remembered that Professor Virchow found those Upper Silesians suffering almost to a man from enlargement of the spleen, which was shown before to exercise an accelerating influence upon the circulation of the blood within the lungs.

The investigations of Dr Bowditch of Boston, U.S., published in 1862, and those of Dr Buchanan, published in the ninth and tenth Reports of the Medical Officer to the Privy Council, undoubtedly show that *dampness of the soil* of any locality has an unfavourable influence on the health of the community residing in it, and that consumption has become less prevalent in such places after the ground has been well drained. It is, indeed, a matter of general experience that most people feel more vigorous and altogether in a better state of health when residing in well-drained localities. Dampness of the soil must then be looked upon as exercising a prejudicial effect upon the health which may be sufficient to excite consumption in persons of weak constitution, or in those specially predisposed to the disease.

It may be safely maintained that all the external or exciting causes of consumption operate essentially in the same manner in generating the disease—namely, by inducing a sluggish state of the circulation and a consequent retardation of the processes of nutrition. Not one of those external causes can be shown to act in any other way. One of the earliest effects even of direct mechanical irritation of the lung substance is to cause stagnation of blood in the capillary vessels. Similarly, a sudden chill, which is not uncommonly an exciting cause of consumption, acts by producing congestion of the lungs which goes on to inflammation and ulceration.

It is instructive to note here the circumstances under which people most easily contract a chill. Universal experience has proved that this is most likely to occur when in a state of exhaustion from any cause, that is to say, when the heart is acting but feebly. Every one knows that it is not on leaving their residences to go to a ball-room that lightly clad ladies are liable to catch cold and inflammation of the lungs, but only after they have been exhausted by the excitement and physical exertion of dancing, and have left the heated and foul atmosphere of the ball-room for the pure but chill air of the street.

That there should be a great liability to catch cold when in a state of exhaustion produced by the action of violently purgative medicines is a well-known fact, and is intelligible on the same physiological principles.

The breathing of impure air acts in precisely the same manner, as any one may easily prove to himself by feeling his pulse when sitting in a crowded assembly. Under such circumstances he will find that the heart beats both less frequently and less powerfully than it does at the same hour of the day when he is sitting in a well-ventilated room or in the open air, provided that the temperature be not so low as in itself to produce depression of the heart's action.

The effect of want of exercise on the pulse is almost too well known to require illustration. Exertion of whatever kind increases both the force and frequency of the pulse. The heart beats more slowly and less forcibly when we are lying than when we are sitting, when we are sitting than when we are leaning, when we are leaning than when we are standing, and so forth, increase of effort being always followed by increase in the force and frequency of the heart's action. To say, then, that increase of effort is attended by acceleration of the circulation is of course equivalent to saying that by indulgence in indolent habits or by sedentary occupation the circulation is rendered sluggish and nutrition retarded.

It may here be said that, were Dr Mac Cormac's theory of the causation of consumption absolutely correct, we should expect to find that persons actively employed in badly ventilated apartments would yield a greater proportion of victims to consumption than others following a sedentary occupation under the same circumstances, breathing, as they do, a larger amount of the impure air. But, as we have already seen, the contrary is the case, as is proved by the greater mortality from consumption of compositors than of pressmen, who breathe the same foul atmosphere in badly ventilated printing establishments.

We must now speak of the influence of certain constitutional diseases in the production of phthisis.

The frequency with which consumption accompanies or follows close on the heels of many other diseases admits of no room for doubt that the former has in some way or other been caused by the latter. For example, diabetes has long been known as a disease during the course of which phthisis is peculiarly liable to attack the sufferer and aid the original malady in hurrying him to his grave. Indeed, in about half of all those who die from diabetes, the disease has been complicated by the superaddition of phthisis. It has often been remarked also that consumption is apt to come on after, or even during the course of typhus and typhoid fevers, measles, scarlatina, and hooping-cough.

These diseases I believe to act as causes of consumption chiefly, if not entirely, by impairing the functions of digestion, from which, as a necessary result, ensues impaired nutrition of the body, which manifests itself by an enfeebled action of the heart and consequent languid circulation in the capillary blood-vessels. To this sluggish flow in the capillaries of the body generally are due the boils, skin eruptions, inflammatory affections of the nasal passages, and of the internal ear, which so commonly occur as sequels of the diseases before mentioned; and to the retardation of capillary circulation in the lungs may be attributed the disposition to recurrent attacks of inflammation, the products of which, instead of undergoing perfect fatty degeneration and absorption, undergo the incomplete fatty degeneration which has been alluded to as "cheesy change" or "caseation."

Before closing this chapter a few words must be said on the question of the communicability of consumption from the sick to the healthy.

It must be admitted that the most diverse popular opinions on this subject meet with acceptance in different countries. In Italy, consumption is generally believed to be so contagious that, if a death from this disease should take place in a hotel or lodging-house, the bed-clothing and sometimes even the bed and other furniture in the room that was occupied by the patient are at once committed to the flames. In the south of France also, where the disease is very prevalent, the general opinion is that it is highly contagious. In the northern provinces of France, as well as in our own country, Germany, Denmark, and the Scandinavian peninsula, consumption is not usually believed to be communicable by a patient to a healthy person.

Many facts may doubtless be cited which seem to lend probability to the contagiousness of consumption. The chief among these are, the frequency with which the disease attacks one member of a family after another, and the apparent infection of a man by his wife and *vice versâ*.

Dr Cotton has shown, however, that among the nurses and medical officers of the Consumption Hospital only one case of the disease occurred in many years; and this is surely sufficient proof that, if contagious, it is not so at the same distance from the patient that diseases such as measles, scarlet fever, &c., are.

But it cannot be denied that persons who occupy the same bed or even the same bedroom have much greater chance of communicating the disease one to the other than patients in hospitals have of infecting the nurses or medical officers; and that the breath of a consumptive patient does contain morbid matter from his lungs is now a well ascertained fact. A healthy person, therefore, who sleeps with a consumptive patient, especially if doors and windows of the bedroom be shut, breathes an atmosphere peculiarly impure, because it contains not only pre-breathed air, but pre-breathed air holding in suspension the products of disease.

We must not, then, dismiss as impossible the doctrine held by many that consumption may be communicated by inhaling the breath of a consumptive patient. It is, at least, wise to act as if this view were the correct one, and to recommend that phthisical patients should occupy beds and bedrooms by themselves, with means of summoning assistance if required.

CHAPTER V.

THE PREVENTION OF CONSUMPTION.

MUCH lies in the power of every one predisposed to this disease to correct the morbid tendency; and, as a matter of course, still more may be done to prevent the disease from attacking a person of originally sound constitution.

As a feeble and scrofulous constitution is engendered by insufficient or improper food, foul air, sedentary employment with insufficient exercise, intemperance in the widest sense of the word, depression of spirits, anxiety, sorrow, &c., it follows that in one already of a feeble habit of body these influences must act far more potently. Such a person, therefore, must especially shun every habit of life known to produce debility, and use every means in his power to strengthen his feeble constitution. His food must be nourishing, ample in quantity, easily digestible, and must consist of animal and vegetable substances in proper proportion.

A valuable hint as to suitable food is to be found in a paper by the late Dr Davy, published in the "Transactions of the Royal Society of Edinburgh" for 1853, and reprinted in his "Physiological Researches" ten years later. In this paper he propounds and answers the following questions:—

1. What are the nutritive qualities of fish compared with other kinds of animal food?

2. Do different species of fish differ materially in degree in nutritive power?

3. Have fish, as food, any peculiar or special properties?

In order to answer the first two of these questions, Dr Davy subjected the muscular parts of different species of fish to a process of drying until they ceased to lose weight; and having done the same with beef, mutton, fowl, cows' milk, &c., he compared the various amounts of solid matter remaining, and found that the percentage of solid matter of fish muscle varied from 17·4 in the hake to 41·2 in the sea trout, and that, in the other kinds of animal food subjected to the same process, the percentage of solid matter varied from 11·2 in unskimmed cows' milk to 30·5 in loin of pork.

The third question Dr Davy answered by subjecting the fish to chemical analysis; and he thus obtained distinct evidence of the presence of iodine in sea fish, slight traces of it in the salmon and other fish that live sometimes in the sea and sometimes in rivers, but none whatever in fish inhabiting fresh water only.

The value of iodine in scrofulous disease has long been known to the medical profession; and Dr Davy was led by his discovery of the presence of this element in sea fish to suppose that persons who consumed this largely as food would probably suffer but seldom from diseases of the scrofulous class.

This supposition was justified by the results of inquiry. Dr Cookworthy, of the Plymouth Public Dispensary, consulted the records of that institution at the desire of Dr Davy, and discovered that out of 654 cases of confirmed consumption and spitting of blood only 4 were of the families of fishermen, which is in a proportion of 1 to 163·5. The entries from which the 654 cases were extracted exceeded 20,000; and Dr Cookworthy believed that had he taken scrofula in all its forms, the results would have been still more remarkable. Further investigation disclosed the fact that the total male population of Plymouth was 24,605, the number of fishermen being 726. On comparing this class with another, that of the shoemakers, whose total number was 608, it was found that of them and their families 37 had died from consumption—19 males and 18 females.

Now, wherein do the habits of life of those two classes of the population vary? In two important particulars. The fisher people lead an out-of-door life, and from one year to another they feed chiefly on the harvest of their nets; whereas a shoemaker's work keeps him within his house, and he and his family presumably eat fish only when they are abundant and cheap. Fresh air and a sea fish diet would, therefore, appear to be the causes by means of which the fisher people are preserved from a disease which is so deadly and so widely spread.

That this immunity from consumption is not to be ascribed merely to the spending of their lives for the most part in the open air, but that it is in large measure due to their food, we see exemplified by the case of fishing communities who, like the Faroese and Icelanders, can follow their avocation for only a few months in the year, and for the remainder live in small, dirty, ill-ventilated huts. Yet Iceland and the Faroe Isles are among the few known spots on the globe where consumption is really rare. Scurvy, leprosy, and other diseases dependent, like consumption, on perverted or impaired nutrition, are exceedingly prevalent among the inhabitants of those islands; but, according to most authors, they enjoy a comparatively great immunity from phthisis; and it is in the highest degree probable, to say the least, that this immunity is attributable to their diet, which consists in large proportion of fish, shell fish, seal flesh, blubber, and other animal and vegetable substances most of which contain iodine in chemical combination with the elements of their tissues.

We see, then, that people of certain habits of life enjoy almost complete exemption from a disease which is perhaps more fatal to mankind than any other; and this is a valuable indication to those predisposed to the disease as to the manner of life they should lead. We cannot, indeed, all follow the occupation of fishermen, or obtain as easily as they can an ample supply of sea fish for food; but there are few in any rank of society whatever who cannot manage to have fish, either fresh or dry, as a part of one at least of their daily meals; and still fewer are debarred from exercise in the open air.

We must, however, never lose sight of what the hereditary predisposition to consumption consists in —namely, weakness of the heart and small calibre of the main blood-vessels, coupled with voluminous lungs; the tissues of the body in general and of the lungs in particular thus receiving a supply of nutriment inadequate to enable them to meet any extraordinary demand on their activity. Nothing can be more self-evident than that, even though the blood be good in quality, if it be distributed to the different organs of the body in a sluggish stream, they cannot take up the matter necessary to repair the excessive waste or damage they undergo when exposed to any hurtful influence.

One of our objects, then, in treating a person not actually suffering from phthisis, but hereditarily predisposed to it, must be to increase the activity and, as a consequence, the size of his heart. It may be asked, Can this be done? Undoubtedly it can, as we may learn from the observation both of health and disease. At each stroke of the heart, the blood is sent from the right ventricle into the pulmonary artery and onwards to the lungs; and from the left ventricle it is propelled into the aorta to be distributed to all other parts of the body. This work cannot be done without tear and wear of the muscular tissues of the heart; and, did not repair go on hand in hand with waste, the action would gradually become weaker and soon cease altogether. As it is, waste and repair go on alternately—the former when the heart contracts, the latter when it relaxes; and under the same circumstances the size and strength of the heart remain the same.

Now let extra work be thrown on this organ, as, for instance, by incompetence of the valves which in health prevent the blood from flowing back into the ventricles on the recoil of the arteries. If these valves do not completely close the opening between the ventricle and the artery when the former relaxes after it has emptied itself into the latter, part of the blood finds its way back into the heart, and thus the body does not get such an ample supply as it does when the valves are acting properly. But, in the well-nourished individual, under such circumstances, the heart becomes larger and stronger; and at each pulsation a quantity of blood is pumped into the vessels which is sufficiently large to keep up the healthy nutrition of the tissues even after deducting what flows back into the ventricle on its relaxation.

We see a similar process take place as the result of exercise in persons of sedentary habits. Within certain limits additional work thrown upon an organ induces in it greater growth and greater ability to perform the increased labour demanded of it. A little consideration will show us how this is, and how it holds good only within certain limits. Let us suppose that a man who has hitherto taken but little exercise decides on altering his mode of life, and on doing so with prudence. He walks a mile more than usual, let us say, and does so at a pace which, though not sufficiently quick to exhaust him, is quick enough to increase the rate and strength of his pulse and to produce a feeling of exhilaration. He reaches his home, rests for a short time, and then feels, if it be near a meal time, that he will do greater justice to his food than he has been in the habit of doing. Now, let us see what has been gained thus far. The pulse has been quickened—that is, the heart has in a given time pumped the blood oftener through the lungs and other parts of the body; and each stroke, having been delivered with greater force, has produced greater dilatation of the arteries than usual. Now, these good effects do not pass off when the cause ceases to act. The increased appetite enables more food to be taken and digested, thus increasing the quantity of the blood; the heart continues for some time to beat with increased vigour, and the dilated arteries that ramify in its own substance carry a larger supply of blood to the active muscular fibres; the mental exhilaration enables the nervous system to keep up the increased stimulus on the heart without exhaustion: in a word, growth is in excess of waste, not only with respect to the heart but to the whole system. And it is not merely the taking up of new matter that is increased; but skin, lungs, and kidneys act more energetically in separating the products of waste.

But if, on the other hand, a man, feeling the benefit of moderate exercise, thinks he cannot get too much of a good thing, and walks until he is exhausted, the results are very different. The exhausted heart beats with less force than before the exercise ; less blood is sent to the various organs of the body; there is depression of spirits, loss of appetite, and a general feeling of languor. More work has been thrown on the body, and less means afforded of supplying the waste. Still, the animal heat must be kept up, and, as the appetite has failed, this must be done at the expense of the body itself.

Let us suppose, however, that the person acts prudently throughout, gradually increasing the amount of his daily exercise as he feels that he is able and continuing to derive benefit from it. However careful he be, there is a limit beyond which he cannot pass without doing himself harm. Few, if any, can sit down and make a hearty meal immediately after violent exertion with any chance of its digesting comfortably. And we know that if smart exercise be taken soon after eating, the digestive process is carried on either very slowly or is entirely suspended. Even, then, if a man should devote his entire time to improving his physical development (which is by no means desirable), he must allow time for the digestion of the increased nourishment he requires; and, again, a limit is placed on the amount of nourishment he can utilise, by the size of his digesting surface.

Moderate exercise, gradually increased and judiciously limited, will thus change a weak body into one comparatively strong; always provided that the digestive powers are not too suddenly called upon to perform the work of rendering the necessarily increased amount of food capable of absorption and conversion into the common source of nourishment for all parts of the body,—the blood. If we attempt to increase our usual exercise too rapidly, the probability is that no good will be obtained, but that, on the contrary, indigestion and general debility will be induced.

To get the fullest benefit possible from exercise, especially if it have been sufficient to bring on perspiration, we should, on returning home, at once strip off our clothing and rub the body dry with a rough towel until the skin is glowing all over. This done, there is no fear of contracting a chill: the cool air playing on the body, instead of making us shrink and shiver, imparts a most grateful sensation; and we dress ourselves in clean dry underclothing feeling refreshed and full of vigour. If, on the contrary, this process is not gone through, we may or may not catch a chill, but we certainly shall feel somewhat stiff and uncomfortable when we have cooled down and our damp underclothing has dried on our bodies. Such details may seem trifling, but it is on trifles that our health and comfort chiefly depend.

Attention to the action of the skin is of the utmost importance for the prevention of chill—one of the commonest exciting causes of phthisis; and it is infinitely better that we should avoid chill by bringing the skin into such a condition that it is indifferent to the influence of sudden changes of temperature, than by loading our bodies with heavy clothing, thus impeding our movements and rendering laborious even moderate exercise. Now, such a condition of the skin it is by no means difficult to induce, if we will only take a little trouble. We may induce this active state of the skin with ease by the judicious use of bathing or the employment of water in other ways followed by rubbing until the skin is all in a glow. It may, of course, be objected that bathing is almost impossible for the great mass of the population, as in comparatively few houses are there even cold water baths. It is quite possible, however, to get all the good effects of cold and warm bathing without the appliances which exist only in the houses of the rich and well-to-do; and it is no less possible, with all conveniences for bathing, so to misapply them as to obtain little or no good. If a house be provided with hot and cold plunge, douche, and shower bath, it is well, and still better if a vapour bath be added to these ; but there seems to be a perpetual disposition on the part of the possessors of such luxuries either to neglect them entirely or to misuse them. For instance, there are some who have a dread of the cold bath, and therefore strictly limit themselves to the use of warm water ; warm water, however, they think relaxing or positively debilitating, and accordingly they bathe but once or twice a week, perhaps not so often. Next we have the man who prides himself on being above the effeminate luxury of the use of warm water, and on having his cold shower or plunge bath every morning of the year. Many go through with this ordeal ; but I venture to say that in cold weather it is to few really other than a most trying ordeal, and to many it is positively hurtful. Then, do such persons imagine that the cold tub really cleans them ? It is indeed but surface cleansing that can be so effected, scarcely better than what can be accomplished by rubbing down with a dry towel, and not so good as what may be done first with wet and then with dry rubbing. And this for the following reason : —At the moment of the plunge or the shock of the shower the nerves of the skin are powerfully stimulated, and excite the minute muscles attached to the hair follicles to contract. This produces the condition of the surface known as *goose skin*, in which the orifice of each hair follicle is protruded, and, as a consequence, the skin roughened and thrown into fine wrinkles, which shut up in their furrows the dried up perspiration and cutaneous scales that are ready to be cast off though still adherent to the uncleansed skin. The colder the water be then, the less access does it obtain to this filth, when used either in the form of a shower or plunge bath.

But it is very different if the skin be softened and relaxed by the influence of moderately warm water. In this case the dried up waste products of the skin are softened and removed ; the mouths of the sweat glands are unclogged ; and effectual cleansing is obtained. We shall find, too, if we stay in a warm plunge bath of a temperature of from 90° Fahr. to 96° Fahr., for from ten minutes to half an hour, that so far from feeling weakened by the process, we are invigorated, and in this state hail the cold shower or plunge with delight. If attainable, the warm plunge bath should be taken at least twice a day, and should invariably be followed, in the morning at least, by a momentary cold plunge or shower. If the second warm bath be taken an hour or so before dinner, it should similarly be followed by the cold; but this may be omitted if the second bath be taken at bedtime.

Comparatively few, however, have the means of obtaining daily warm and cold baths in their own houses; and perhaps few of those who have can afford the long time necessary for the proper use of the warm plunge bath. But if we can attain the same desirable end by simpler means we are nearly as well off. The most luxurious of those simple means is the alternate ~~means of the~~ hot and cold shower. Should this not be obtainable, however, we can get nearly as much benefit though not so luxuriously in the following manner:—Get a shallow circular bath, a pitcher containing about a gallon of hot water, and another containing about as much cold. Put a basin into the bath and pour into it some of the hot water, and reduce the temperature to what is agreeable by adding some cold water. Then kneel down before the bath, and with a sponge flood the head, neck, and face with the warm water; rub plenty of soap on, and use the rich lather thus formed to rub on the rest of the body, paying especial attention to the folds of the joints. Now get into the bath in a crouching position, and with a large honeycomb sponge sluice the warm water over the whole body until the soap is all removed. The hotter the water is, consistently with comfort, the better for what is to follow—namely, free douching of the head first and then of the body and limbs with the cold water. After the hot water the shock of the cold will be found no more than pleasant. Subsequent to baths of every kind the body should be briskly and thoroughly dried ; and it is well to finish off with a thorough rubbing down with the flesh gloves and strap.

Besides rendering the skin less susceptible to chill, the judicious use of the bath effects further benefit by stimulating the heart to increased action. Now, increased action of the heart, within the limits of comfort, is of especial value to persons of the phthisical and scrofulous habits of body. In such persons it is desirable to induce increased rapidity of the process of nutrition, so that appetite may be excited, secretion and excretion stimulated, and the waste products of the body prevented from accumulating in the blood and interstices between the elements of the tissues.

While, however, ablutions such as have been alluded to, when conjoined with ample exercise, are of great value in accomplishing this purpose, they are much less efficient than the more energetic means used in hydropathic establishments, such as the wet pack and Turkish bath. Of both these it may be well to say a few words. The wet pack can easily be taken by any one in his own bedroom. A sheet is soaked in cold water, well wrung out, and spread on the top of two or three blankets. The person then lies naked on the top of the sheet, and it is tucked round his limbs and body, care being taken not to wrap it too tightly round the chest, so that respiration may be perfectly unimpeded and comfortable. The dry blankets are then wrapped round the body, and the pack is complete. The first sensations thus produced are the reverse of pleasant; but soon the natural heat of the body raises the moisture of the sheet in vapour, and a delicious feeling of comfortable warmth pervades the whole system. Sometimes in chilly people the warmth is somewhat slow of development; but it may always be hastened by putting a hot bottle to the feet between the sheet and the blankets Soon after the body has become warm a gentle perspiration bursts forth, which should be encouraged by taking hot drinks, of which there is none better than "*skilly*," a thin gruel made by thoroughly boiling oatmeal until it can swell no longer, when it must be strained, seasoned with a little salt, and if desired sweetened with sugar. After perspiration has been flowing for from ten to twenty minutes, the blankets and sheet are to be thrown off, the body sponged first with warm and then with cold water, and finally rubbed thoroughly dry. The skin then seems to drink in the cool air. It is not uncomfortably warm, and yet the wind may blow upon it without the slightest risk of chilling.

To the processes above described it may be objected that the aid of another person is required. A slight modification, however, will enable any assistance to be dispensed with. Instead of using a damp sheet use drawers with feet attached, and a long jacket overlapping the drawers with sleeves coming over the hands; soak them in cold water and thoroughly wring them, then put them on, and there will now be but little difficulty in tucking the blankets round the body. As a means merely of preserving health it is not necessary that the wet pack should be taken very frequently or for long at each time. Twice weekly for an hour at a time will be all that is necessary if the ordinary daily ablutions are also performed.

Still more efficient as a means of cleansing the blood, promoting rapid excretion of waste products from the body, and preventing susceptibility to chill, is the vapour or Turkish bath. There seems to be a strange propensity, however, in the proprietors of public Turkish baths to carry their principles to excess. In many of them temperatures so high as to be positively distressing are employed; and the air, instead of being moist and balmy, is dry and scorching, making both eyes and nostrils smart. Sometimes, too most troublesome palpitation of the heart is produced; and this circumstance has doubtless led to the general opinion held both by medical men and the public that the use of such baths is highly injurious to persons suffering from diseases of the heart. This opinion is unquestionably correct; the use of *such* baths cannot but be dangerous to persons whose hearts are diseased, and is injurious to any of weakly constitution. I should not like to say that such high temperatures are *never* of value; but I am not aware of any cases in which they are useful, and I do know they often effect great harm. In persons who perspire with difficulty, the little perspiration which flows is at once evaporated, the skin remaining parched and hot; while in those who perspire freely the loss of the fluid portion of the blood in the form of perspiration is so rapid that serious discomfort or even danger from faintness is apt to ensue. It may be fully admitted that perspiration consists merely of water holding effete matter in solution, and that the loss of such can do no harm. The loss of effete matter can certainly do no harm, nor indeed can the loss of water, provided this do not take place so suddenly as to make a serious alteration in the quantity of the fluid of the blood. By all means let there be free perspiration; but let it take place slowly enough to permit of the blood absorbing an equivalent or nearly equivalent amount of fluid at the same time through the lungs and alimentary canal, it being the composition and not the quantity of the blood that we wish to alter. The temperatures employed should therefore be comparatively low, varying from about 100° Fahr. to 120° Fahr.; and the air of the room should be loaded with moisture.

Inunction with animal fat—such as a mixture of lard and suet, which must of course be thoroughly purified, and may be perfumed if desired—will add much both to the comfort and the benefit to be derived from the Turkish bath. This was a custom in universal use among the Romans in their baths, and it is a great pity that it is not revived and generally used in the Turkish baths of the present day. At first thought, the natural opinion will be that the custom is a filthy one and more honoured in the breach than in the observance. It may indeed be admitted that it would be filthy and disgusting, did it simply consist in smearing the body with fat. This, however, is not the case. *In*unction, as the term implies, consists in rubbing *into*, not merely *on* the skin, such ointments as may be thought desirable. There is none better than that recommended by Mr Taylor in his work "On a New Method of Treating Febrile and other Diseases." This consists of a mixture of equal parts of lard and suet; and a sufficiency of detail may be found in Mr Taylor's book of the marvellous results he obtained by its use. After the bath, this ointment should be thoroughly rubbed into the whole body, and all superfluity then wiped off with a linen cloth. The amount that is taken up by the skin is astonishingly large; and by means of it a suppleness, smoothness, and elasticity are produced, which are unattainable by any other means. We must expect to hear from some that all that such a proceeding can accomplish is a choking up of the pores, and interference with healthy perspiration. But that the reverse is the case may be proved to the satisfaction of any person by the following simple experiment. Let one half only of the body be anointed before entering the Turkish bath, and it will be found not only that the perspiration begins to flow on that side first but that it flows far more freely than from the parts of the body that have been left untouched with the ointment.

A further benefit which is obtained by the use of inunction after the bath is that by this means a large quantity of animal fat is got into the body without throwing work upon the digestive organs, which, in a large proportion of persons predisposed to consumption, are delicate and accomplish the digestion of fat with difficulty and discomfort.

It has often been remarked by medical men that children characterised by the scrofulous or consumptive habits of body frequently show great dislike to fat; that they carefully separate it from their meat and eat the lean only; and that, if compelled to eat the fat, such children are simply made ill. Yet those very children will often eat bread and butter or green peas to which plenty of dripping or butter has been added, and exhibit no resulting symptoms of indigestion. A valuable lesson may be drawn from this. The child cuts the fat from his meat and puts it aside, because he either feels instinctively or knows from experience that he will be made uncomfortable if he eats it; whereas he is neither naturally repelled by the bread and butter or green peas dressed in the usual way, nor has he experienced discomfort after eating them Now, let us consider the difference between the two cases. In the first, the fat is presented to the child in a solid massive form; in the second, it is more broken up by being spread on the bread or saturating the peas, with either of which it becomes more intimately mixed in the process of chewing. We see here, then, that fat which is repulsive when presented in a mass is pleasant when broken up; and we should learn from this that the proper way to administer oils and fats to children and others of weak digestion is in the more easily digestible form of minute division. The same weight of fat which a child would revolt from eating when in the solid form, he will greatly enjoy when it is sopped up by a baked potato; and the great majority even of scrofulous persons will digest fat so presented to them with perfect ease. Of course moderation must be observed in this as in all articles of diet; but even in moderation we shall find that some persons are repelled by fat however carefully administered; and it is in such cases that the benefit to be derived from inunction of an ointment composed of animal fat is most markedly observed. The more thoroughly the skin be cleansed before practising the inunction, the better will be the result; and where the use of the wet pack, the vapour bath, or the Turkish bath is impracticable, or strongly objected to by the patient or his friends, friction with a rough towel, or, still better, with the flesh gloves, must first be employed..

Gymnastics, such as dumb-bell exercise, the use of the chest expander, or the trapeze, constitute a most useful means of preserving health and increasing the power of the heart and the capacity of the chest. Another form of gymnastic exercises, which has special influence upon the lungs, and particularly upon those parts of the lungs that are least expanded in ordinary respiration, consists in taking long deep breaths, expanding the chest to its utmost capacity, and then expelling as completely as possible the air that has been taken in. One very decided advantage of this system of lung gymnastics, apart from its value in accelerating circulation within the lungs, is that it may be practised at any time during the day while following our usual avocations and without attracting attention. But this exercise, like all others, must be used judiciously. If those deep inspirations be made too hurriedly, or for too long at a time, giddiness and the discomfort attendant upon it are almost certain to be experienced. They should, therefore, be made slowly, drawing in and expelling the air through the nostrils only; and on first beginning this exercise it may be well to respire in the ordinary way a few times between each of the profounder acts, so that the first approach of giddiness may be observed and the exercise stopped for the time being. Although it is true that in persons of the phthisical habit the lungs are naturally voluminous relatively to the size and strength of the heart, and it may therefore be thought unwise to seek to increase their capacity; we must not forget that, in increasing the capacity of the chest by means of exercise, we do not merely obtain addition to the volume of the lungs, —the heart also is more than proportionally enlarged and strengthened, and is better able to supply a proper quantity of blood to the now more expansive lungs than it was in its former state to furnish an adequate supply of nutriment to these organs while yet unimproved.

It cannot, however, be too strongly insisted on that moderation must be observed in exercise of every description, whether gymnastics, walking, riding, or even driving. Nothing approaching to exhaustion should ever be permitted. Exercise should always be stopped before it becomes unpleasant to continue it.

But of all the means by which health may be preserved and improved there is none so valuable as fresh air on all occasions, whether by day or by night; and provided we are well and warmly clothed we can get far less harm from cold than we can from impure air. I do not hesitate therefore to recommend that either in the sleeping room of every one or in the room next to it there should be a widely opened window. If the wind do not blow directly upon the bed, and its occupant breathe through his nostrils only, there is no chance of his catching cold, and he will wake in the morning far more refreshed than had he been breathing the confined air of a room without any means of proper ventilation. It need not be said that, if the window in the next room only be open, there must be free communication between the two rooms by widely opened doors.

But, apart from the preceding, which relates principally to the maintenance of health in general, or the correction of the scrofulous and phthisical habits, it must be remembered that the prevention of consumption involves the prevention and cure of scrofula. To accomplish this, a knowledge of the family history of the person under treatment will be of great value. If a thoughtful medical practitioner knows that a child has been born of parents in whom or in whose relatives scrofula or consumption has appeared, he will advise that special care be taken that the child be not exposed to the contagion of any of the common diseases of children, such as measles, scarlatina, hooping-cough, &c.; or if he should have contracted any one of those diseases, he will recommend great attention to the child during convalescence, warning the parents to take notice if glandular enlargements appear in the neck or under the jaw, and to have instant good medical advice if such signs manifest themselves, or if there be offensive discharges from the nostrils or ears.

As good medical advice, however, is not attainable under all circumstances, I will here mention the means that I have found most effectual in the cure of such manifestations of scrofula. The principle of success lies in treating the patient both constitutionally and locally. The general health must be mended by withholding improper food, by seeing that the child eats only at regular intervals, which must not, however, be too long, and that he does not then swallow his food without thoroughly chewing it. Unskimmed milk should form a large part of his diet, and should be taken twice daily at least. It must not be forgotten, however, that milk, though liquid, contains a large amount of solid nutriment. Indeed it must be regarded as virtually a solid food; and it must therefore be taken in mouthfuls, not drunk off like so much water. It is better always to take milk in small quantities at a time *after* chewing thoroughly a piece of dry biscuit or bread, which may be spread with butter; and it is well to keep each mouthful of milk in the mouth for a few seconds before swallowing it, so that it may become mixed with the saliva. If the child appear to be made bilious by the use of large quantities of milk, the addition of half a teaspoonful of phosphate of soda to each imperial pint will generally prove sufficient to prevent this. Butcher meat and fresh vegetables should be given at least once daily, and bread and butter at each meal. After each meal cod-liver oil, as colourless and odourless as is to be had, provided the absence of colour and smell has not been attained by artificial means, such as bleaching, should be administered in small doses, in combination with a few drops of syrup of the iodide of iron ; and, if digestion is feeble or the appetite poor, two or three drops of tincture of nux vomica may be added to each dose. The warm bath, followed by the cold douche, friction with a not too hard flesh brush, and inunction, should be used every morning ; and in the evening the wet pack should be used about two hours after the last meal ; this latter being likewise followed by the warm and cold douche and inunction. Glandular swellings that are merely in an indurated condition may often be made to recede by the application of lint soaked in olive oil containing 10 per cent. of pure carbolic acid in solution, which dressings must be changed morning and evening and sometimes even more frequently. If the glands have gone on to suppuration they should not be allowed to open naturally, but the pus should be let out antiseptically in the following manner:—The skin over the swelling is carefully washed and dried; a piece of lint soaked in olive oil containing pure carbolic acid in the proportion mentioned above is then laid over it; a thin double-edged knife is smeared with the same oil; and, the lint being lifted up from below like a curtain, the knife is rapidly made to pierce the cavity of the abscess. The lint is instantly replaced and the contents of the abscess thoroughly pressed out under cover of it. When this has been done the surrounding skin is wiped clean, the dirty lint removed, and immediately substituted by a fresh piece soaked in the same carbolised oil; next, several larger folds of lint which have been soaked in a strong solution of chloride of zinc (such as Sir William Burnett's disinfectant fluid) and then squeezed dry, are placed over the oiled lint, and should be large enough to overlap it on all sides; and finally, this dressing is to be secured by a bandage.

Offensive discharge from the nostrils should be treated by washing out the passages thoroughly with a solution of chloride of zinc of the strength of half a grain or a whole grain to each ounce. This is very easily done, and without much discomfort to the patient. A large syringe is to be filled with the lotion; an indiarubber tube large enough to require a little coaxing to get it inserted into the nostril is then fastened by one end to the nozzle of the syringe, and the other end is introduced fairly within the nostril. The patient then bends his head over a basin and breathes through his mouth, thus cutting off all communication between the nasal passages and the throat; and the contents of the syringe are slowly emptied into the one nostril and run out from the other into the basin. This process may be still more conveniently performed by means of the nasal syphon douche. In default of both the syringe and the douche the disinfectant lotion may be sniffed up from the hollow of the hand; but this is both less effectual and more disagreeable than either of the two other methods. It may nevertheless prove of value in the case of children who are frightened by the sight of instruments.

Discharge from the ears (otorrhœa) is most easy to subdue by careful attention to cleanliness and medication. The auditory tube must be gently syringed, first with warm water, and then either with the weak chloride of zinc lotion mentioned above, or, still better, with a lotion prepared according to the following formula :—

Tannic Acid, sixty grains.
Pure Carbolic Acid, sixty grains.
Glycerine, one fluid ounce and a half.
Water, a sufficiency to make the whole measure six fluid ounces.

If the ear be very tender, we must be content with merely dropping in first water and then the lotion, making the patient alternately incline his head so that the tube of the ear be completely filled and emptied. A piece of cotton-wool soaked in the lotion should be placed loosely in the tube of the ear. Of course a medical man should examine the ear by means of the otoscope in order to determine exactly upon what the discharge depends; but the instructions as to treatment given above can do no harm, whatever be the cause of the complaint. Advantage might doubtless be derived from examination with the otoscope, however; and, if an opportunity offers, a medical man should always be consulted in such cases.

One of the most valuable means at our disposal for the correction of the scrofulous habit of body, and even for the cure of scrofulous disease, consists in residence at the sea-side and the use of sea-bathing. But from the haphazard and unskilful employment of such remedies, positive harm, instead of benefit, is often derived. Sea-water is not merely a solution of common salt in water, nor does sea air differ from the air of inland localities merely in containing a larger proportion of watery vapour. The water of the ocean must be considered as a true natural mineral water—that is to say, its properties cannot be obtained by any artificial solution in distilled water of the various salts contained in it. Take, for instance, a gallon of sea-water, and evaporate it by a gentle heat to dryness; then restore the water dispelled, by adding to the dry salts sufficient distilled water to make the whole measure a gallon. Do you now obtain water which cannot be distinguished from true sea-water? Most certainly not. Chemical analysis may not be competent to detect wherein it differs from it, but the human organism is. The taste of true sea-water differs considerably from that which has been made by first evaporating it to dryness and then making up to the original volume with pure water; and still more does the effect produced on the body by sea-bathing or even merely bathing in sea-water differ from bathing in water to which has been added "sea-salt." This we can understand by a very little reflection on the subject. Not only does sea-water contain, in addition to common salt, the iodides of sodium and potassium as well as other salts of magnesium, potassium, and lime: it also contains minute animal and vegetable organisms, and a large amount of air, which can scarcely fail to exercise some influence on the human body when immersed in it. The small quantity of water contained in a bath-tub is, moreover, at rest; and it thus fails to excite the skin in the same manner as the ever-moving, unresting sea. Such considerations should be sufficient to show that while baths of sea-water and even solutions of common salt in water may be very valuable as substitutes for bathing in the sea, they are by no means equivalent to it. It must also be remembered that sea-bathing necessarily involves the breathing of sea air, which, as has been said before, differs from the air of midland districts not merely in containing more watery vapour, but holds in addition the salts of the sea-water suspended in a state of minute division. The wind catches up the spray from the breaking waves, and this spray is scattered into fine particles, the saline constituents of which may be detected by chemical analysis of the air over the sea, at the sea-coast, and even at some distance from it.

Regarding the sea, then, as a mighty mass of mineral water, it must be remembered that measures powerful for good when properly used are as powerful for harm when abused. Staying in the water until the teeth are chattering and the body is livid with cold can only be productive of harm, and is more than sufficient to counteract the benefit that would otherwise be derived from residence at the coast. Loss of flesh, appetite, and good spirits, rapidly ensue; and the sufferer then declares that sea-bathing does not agree with him. But such a person has not given sea-bathing a fair trial—he has simply grossly abused it. The judicious bather undresses quickly, plunges into the water head first, and leaves it before he feels, or the very instant he feels, in the least inclined to shiver. Having acted thus, if he does not feel invigorated and glowing all over after he has dried and rubbed himself thoroughly, he will be justified in saying that sea-bathing does not suit him. One or two precautions must, however, be observed, if all the beneficial effects of sea-bathing are to be obtained. If a sea-bath is taken the first thing in the morning, it must be literally for a few moments only —no dallying in the water can be allowed. But it is not thus that the full benefit of sea-bathing can be obtained. If the greatest possible good is wanted, the bather should select a time when the sun is up and about two hours after he has made a comfortable meal. He may then remain in the water until the approach of chilliness or shivering warns him that he has had enough; and, after a thorough rub down, he must dress quickly, putting off no time in combing or brushing his hair, and take a short smart walk before returning home.

Few persons can, with benefit to their health, bathe in the sea more than once daily in the thorough manner just mentioned. A mere plunge may, however, be taken by most of us in the early morning with pleasure and without the least evil effect; but it must be literally a single plunge and no more.

If the bather can swim, so much the better. He will thus be able to keep up a continuous delightful motion while taking his regular sea-bath, which will add not only to his pleasure but to the benefit he will derive from it.

Children must be *encouraged* to enter the sea, and on no account compelled to go in against their inclination either by brute force or scarcely less brutal ridicule and taunts of cowardice. Some children, it is true, will never be persuaded to enter the water; but the want of the bathing will do them less harm than forcibly seizing and ducking them would. Then it must be remembered that a substitute for genuine sea-bathing (imperfect, certainly, but better than nothing) may be had in the shape of sea-water baths in the house.

The great majority of children, however, if judiciously and kindly treated, will take to the sea as to their best friend. Select some sandy nook and a warm day; undress the child, and let him scamper with a companion along the water's edge. From going in ankle-deep, he will venture up to his knees; and soon he will be encouraged to try a plunge. It would be well, when possible, to have every child taught to swim in a tepid fresh water swimming-bath before taking him to the sea. This would make him less timid; and, feeling the buoyancy of his body greater in the sea-water than in the fresh, he would revel with delight in the enjoyment of swimming, one of the most pleasant and useful of exercises. It need not be said that bathers are most unwise, whether they be swimmers or not, to bathe from off a beach where the currents are strong, and that they do not know to be free from shifting sands.

A warm sea-water bath can, of course, only be had within doors. Taken at bedtime, it is a great luxury, acting as a soporific more potent than most and more pleasant than all the drugs under the sun. Its value is very great for such as are too feeble to leave the house, or for those who cannot be induced to take a genuine sea-bath.

While the generally beneficial effects of residence at the sea-side and sea-bathing are unquestionable, it must be admitted that there are many persons who form exceptions to this rule. Nervous disturbances, debility, loss of appetite, and sleeplessness are among the most common of the troublesome symptoms experienced by those for whom sea air and sea-bathing are unsuitable. Scarcely any person whose digestion is feeble is benefited by the sea air; residence in a bracing hilly district being much more adapted to such persons.

It must be remembered that, as has been said in a previous chapter, inflammation of any part of the respiratory organs may lead to consumption; and, in considering the means by which this disease may be prevented, a few words must be said on the treatment of inflammatory diseases of the lungs and air-passages.

Up to thirty or forty years ago pneumonia, or inflammation of the lung substance, was treated by bleeding, low diet, and drugs which diminished the force of the heart's action; and, by the united influence of these depressing measures, the physician strove to lower the temperature of the patient's body, and to diminish the force and frequency of the pulsations of his heart. It cannot be denied that by this lowering treatment these ends were often attained; but the mortality from the disease under such a system was frightfully high. To seek to reduce the temperature of a patient suffering from inflammation of the lungs by the abstraction of blood, the withholding of an ample amount of nourishing food, or the administration of depressing drugs, is to run a great risk of letting him die from exhaustion of the heart; and, in any case, such treatment renders recovery more tardy and increases the chance of consumption supervening.

The quickened action of the heart in all diseases in which fever is a prominent symptom is an indication of exhaustion, not of strength; and the increased temperature of the body depends on the evolution of heat generated by the degradation and waste of the tissues. Under ordinary circumstances the temperature of the human body in health remains almost constant, no more heat being generated than what is carried off by the external air from the exposed surfaces of the skin and lungs. In fever the case is altered. Here the production of heat is in excess of its dissipation; and the temperature of the body therefore rises. It is on this increased temperature of the body that the increase in the rapidity of the heart's action depends, heat being a powerful excitant of this organ. When we remember that but little food is taken by most patients suffering from fever, we can see it to be self-evident that increased action of the heart must be rapidly followed by its exhaustion; and, therefore, though pulsating more frequently in a feverish patient than in a healthy person, the individual beats of the heart are weaker. In febrile states of the body, moreover, the germinal matter or bioplasm is greatly increased, and especially so in the minute vessels, in which, therefore, the circulation is more or less obstructed by the increased resistance offered to the passage of the blood by the little masses of rapidly growing germinal matter which project from the walls of the vessels into their interior. (See Professor Lionel S. Beale on "Disease Germs.")

In the treatment of inflammation of the lungs we must strive to diminish the rapidity of the heart's action, and to add to its strength; and this we can only accomplish by reduction of the fever. In mild cases of the disease, occurring in otherwise healthy persons, recovery takes place naturally in a few days if the patient be simply well nourished and kept at rest in bed in a cool well-ventilated room; but even in those mild cases recovery will be accelerated by the administration of from five to ten grain doses of carbonate of ammonia every four or five hours, this medicine being both stimulant and febrifuge. In cases of great severity, however, where the temperature has mounted to from 103° Fahr. and upwards, a much more powerful febrifuge ought to be employed, —namely, cold water. A long plunge bath should be brought to the bedside of the patient and filled with water at as low a temperature as possible. A stimulant of strong wine or brandy is first given to the patient, and in two or three minutes afterwards he is placed in the bath and kept there until the temperature, as shown by a thermometer placed in his mouth, has fallen to what is natural in healthy persons. During the time that the patient is in the bath close watch must be kept upon the state of his pulse, and, should it appear alarmingly weak, he must be plied with stimulants. After removal from the bath, the moisture must be quickly sopped up from his body with towels, and the patient returned to his bed; the bath being repeated when the temperature again becomes dangerously high.

The cases of pneumonia, however, that require such troublesome and apparently severe methods of treatment are but rare.

The value of cold bathing, or failing it, of packing in a dripping sheet, in the severer cases of this disease, can scarcely be overrated. Soon after such treatment has been begun the patient's intellect becomes clearer, his skin loses its pungent heat and becomes moist and cool, his pulse gains in force and loses in frequency, respiration is less hurried, appetite improves, and he enjoys refreshing sleep. Physical examination of the chest proves that this amelioration of general symptoms has been coincident with progressive disappearance of the inflammatory exudation in the lungs.

A few words must be said on the manner in which cold acts in reducing the temperature of fevered patients, especially as there is still a very general belief that the application of cold externally simply drives the heat from the skin to the internal organs, and thus does more harm than good. The primary effect of the process appears indeed to justify this view. Almost immediately on the immersion in cold water either of a healthy person or a fevered patient the temperature of the interior of his body begins to rise. This is probably due, in part at least, to the blood-vessels which supply the skin contracting under the influence of cold; and the blood not being admitted to them is subjected to no cooling action, while the internal heat continues to be generated at the same rate as, or possibly at a higher rate than before immersion. Additional work is at this time also thrown upon the heart by the obstruction to the circulation in the skin ; and it is for this reason that, if we do not wish to run the risk of collapse from exhaustion of the heart, we must administer a stimulant before putting the patient into the bath. The elevation of internal temperature which at first takes place soon ceases, and gradually falls until it reaches that of health, when the patient must be removed from the bath. Of course, if continued sufficiently long, the temperature of the body might be reduced by the cold bath to a point so low as to be incompatible with life.

As other inflammatory affections of the respiratory organs comparatively seldom lead to consumption, nothing will be said about them here except that depressing means of treatment should never be adopted.

CHAPTER VI.

THE CURABILITY AND TREATMENT OF CONSUMPTION.

IF, in future ages, there should be written a historical account of the views held on the subject of consumption by medical men and the public at large, I venture to say that the author will quote as an instance of error's tenacity of life, the persistence with which this disease was continued to be regarded as absolutely incurable. That the general public should retain this belief is perhaps not greatly to be wondered at; but how any medical man, or at least any medical man who has regularly attended the *post-mortem* room when a student, can deny the curability of consumption, is simply inexplicable. Surely no such medical practitioner can dispute the fact that, in the bodies of patients who have died from diseases other than consumption, the lungs are often found to present such appearances as furnish unmistakable proof that cavities have existed in them at some previous time, and that these have afterwards healed by shrinking and adhesion of their walls.

Indeed, nothing is more certainly true than the dictum of Dr Carswell that pathological anatomy has perhaps never afforded more conclusive evidence in favour of the curability of any disease than it has in that of pulmonary phthisis.

The late Professor Bennett of Edinburgh made a series of *post-mortem* examinations in the year 1845, and found that in the lungs of not fewer than one-third of all persons over forty years of age whose bodies he examined, there were unquestionable proofs of consumption having previously existed and of having been arrested or cured. In some of those cases there were shrinking and puckering of the lung substance; and, on making sections of such parts, scars were brought into view, which showed that portions of the lung had been destroyed and that the cavities thus formed had healed by contraction and adhesion of their walls. In other cases the disease had been arrested in the first stage, the products of inflammation having shrunk and undergone chalky degeneration, the mass of morbid products being shut off from the healthy lung substance by a capsule of fibrous tissue formed round it.

The *post-mortem* examinations of the bodies of persons who had died at a more advanced period of life (from sixty upwards),.made by Drs Rogée and

Boudet, at the Salpetrière and Bicêtre Hospitals, showed that of such persons from one-half to four-fifths had at some period of their lives suffered from consumption, perfect recovery from which had taken place either with or without medical aid—perhaps, indeed, in spite of it.

In the year 1849 Dr Walshe published the results of his experience in the Brompton Hospital for Consumption, which were to the effect—

(1.) That in about 4½ per cent. of all cases admitted, all the general symptoms and physical signs were removed.

(2.) That in about 8 per cent. the general symptoms disappeared, but some abnormal sounds could still be heard on listening to the chest.

(3.) That more than half of the cases of phthisis undergo improvement which is more or less permanent.

The natural conclusion to be drawn from the foregoing facts is that, if a medical man should maintain that he has treated a large number of consumptive patients without having met with a single case of recovery where the disease had been unequivocally proved to exist, his treatment has been such as has done positive harm. For it cannot be seriously denied by any one that *post-mortem* examinations prove the frequency with which consumption is cured in persons so low in the social scale as to have had no regular medical aid; and surely, if a practitioner simply refrains from doing harm by his prescriptions and instructions to his phthisical patients, he can scarcely fail to find that in some few, at least, out of a large number of cases, permanent recovery is somehow or other effected.

But, while some physicians have willingly admitted that consumptive patients occasionally recover perfect health, they at the same time maintain that such cures are due to nature only, and that medical skill is powerless in the treatment of this disease except to palliate symptoms. Truth and error both exist in this opinion. Every cure of every disease, however artificial the remedy may appear to be—even the cure of ague by quinine—is of course due to nature, in the sense that the art which adds to nature is an art that nature makes; but it is no less true that the physician whose practice is distinguished by united care and skill can yield as much aid to nature in her efforts to effect the healing of an ulcerated lung as the surgeon can to the natural process of the healing of an ulcer on any outer part of the body. And, in speaking of nature in the usual metaphorical manner, we must not forget that the processes of disease are as much natural phenomena as are those of health.

It need hardly be said that it is not pretended that every case of consumption can be cured, or indeed that in any case the lung can be restored to exactly the same condition that it was in before the invasion of the disease. Physicians who maintain the curability of phthisis do so only in the same sense that they maintain the curability of ulcerations whether external or internal, of measles, scarlatina, typhus and typhoid fevers, &c., deaths from which are taking place every day in the year.

In any of the three stages of consumption, a cure, in the sense of complete arrest of the morbid process and healing of the ulceration, may often be effected; although it is of course self-evident that the earlier the stage of the disease in which treatment is begun the more likely is the skill of the physician to be of avail. It is equally certain, however, that just as there are some cases of comparatively simple diseases such as those mentioned above, in which the state of the patient goes from bad to worse in spite of the greatest care and skill, so we must expect to find that the course of consumption will sometimes steadily advance to a fatal termination, however early the patient put himself into the hands of a medical man of whose ability and conscientious attention there can be no doubt. But such cases are, fortunately, rare; and nothing can be more certain than that consumption is *generally* susceptible of as complete cure as almost any other disease the process of which is characterised by inflammation and ulceration, when skilful treatment is early adopted, and *not unfrequently* even when in an advanced stage.

The late Dr Von Niemeyer of Tübingen laid it down as a rule that, if a consumptive patient be desirous that his disease should terminate in a cure, he must place himself under the constant control of an intelligent and strict physician. That this is highly desirable there can be no doubt. Unfortunately, it is equally doubtless that few phthisical patients can afford to do this even if they happen to know where to find the intelligent and strict physician; and should such a patient place himself under the constant control of a physician who regards consumption as incurable and palliative treatment alone applicable to his case, he is more likely to be harmed than benefited, and would have acted more wisely had he left nature to kill or cure.

In whatever stage the disease may be, the condition of the patient may vary as regards the presence or absence of fever, and treatment must vary accordingly. Fever, in consumption as in all other diseases, can only be likened, in its effect upon the body, to burning a candle at both ends. Not only are the tissues being wasted as much as if the patient were performing hard bodily work; they are at the same time subjected to an abnormally high temperature, and this of itself causes degradation of the tissues and nervous disturbance. When to this is added loss of appetite and indigestion, we can see how great is the drain made on the constitution by the presence of fever.

In this state of the patient, therefore, all our efforts must be directed towards subduing the fever, improving digestion, and nourishing the body by as rich a diet as he can take without disorder of the stomach being induced. He must be kept in bed in a room, cool and thoroughly well ventilated, whatever be the season of the year. If the skin be hot and dry he must be packed in a wet sheet until perspiration is excited; and in such cases it is well, instead of oppressing the patient with the weight of heavy blankets outside the wet packing, to use a waterproof sheet for the prevention of evaporation. After sweating has been induced and gone on for from half an hour to an hour, the patient must be thoroughly douched with cold water, gently dried, and again put to bed. Before giving the douche it is often desirable to administer a glass or so of wine which may be heated if the pulse be exceedingly feeble. I may here say that of all wines the Hungarian is the most useful in the treatment of consumption. This is said by Dr Brehmer to be due to its containing phosphate of lime in combination with organic bases. Whether this be the case or not, it is certain that phosphate of lime is an essential constituent of all organic tissues; that in consumption, as in other wasting diseases, it is being excreted in unusually large quantities; and of the superior efficacy of Hungarian wines to all others in consumption and other exhausting diseases in which the use of alcohol is advisable I have no doubt.

If the consumptive patient, though feverish, be perspiring freely, the cold douche alone, without previous wet packing, will generally prove sufficient to effect a marked lowering of his temperature.

But while the hydropathic treatment of the febrile state in consumptive patients is unquestionably superior to any other, it cannot be denied that in some cases the opposition offered to it by the patient and his friends can scarcely be overcome. If, in such cases, the physician should insist upon this method of treatment being carried out, the probability is that, unless he see to it personally, it will be done so inefficiently, if done at all, that little or no benefit is derived from it.

Fortunately, by means of certain drugs, great improvement can be effected in the state of the patient without depressing the vital powers. Foxglove and quinine, although alluded to in depreciating terms as heart poisons by some medical men who look upon drugs as incapable of effecting any benefit in consumption, are of the greatest value in the treatment of the hectic fever which preys on so many consumptive patients. That in large doses those drugs are poisonous is unquestionable; but it is not in poisonous doses that they are recommended to be administered. They both enter into the composition of the modification of Heim's pill proposed by Dr Von Niemeyer and largely used on the continent of Europe. The formula for this medicine is—

Sulphate of Quinine, twenty grains.
Powdered Foxglove Leaves, ten grains.
Powdered Ipecacuanha Root, } of each five grains.
Powdered Opium, }
Extract of Elecampane, a sufficiency to make a mass, which is to be divided into twenty pills.

The administration of one of these pills three or four times in the course of the twenty-four hours will sometimes act like a charm in reducing the temperature of the patient's body and the rapidity of his pulse while adding to its strength. Two further modifications I have been in the habit of making in this pill—one, the substitution of the hydrobromate of quinine for the sulphate, in cases marked by great nervous disturbance; the other, the addition of twenty grains of powdered squill, if dropsy, as indicated by puffiness under the eyes and swelling of the feet and ankles, be present. The hydrobromate of quinine, uniting in itself the sedative qualities of hydrobromic acid with the tonic qualities of quinine, may be substituted for the sulphate with decided advantage in all cases except those in which the larynx is ulcerated. In the latter class of cases it is quite inadmissible, as, even in very small doses, it brings on severe fits of coughing. Occasionally, patients will be met with who cannot take ipecacuanha even in the minute doses in which it is contained in the pills above mentioned; and before prescribing them it is always proper to ascertain whether the patient has this constitutional antipathy to the drug, and, if so, either to omit it entirely from the medicine or to prescribe it in still smaller doses. If the pill mass, instead of being divided into twenty pills, be divided into a hundred, and one of these little pills administered every hour, equally good, if not better, results follow from their use ; and I have never found on any occasion that nausea has been produced when the medicine has been thus administered.

The inunction of the ointment mentioned in the previous chapter is another most valuable means of diminishing the feverish state; and few, if any, patients will ever be found to object to it—none, indeed, who have once experienced the comfort produced by it. By the use of this simple means, the patient's nervous system is soothed, the hot harsh skin cooled, rendered supple and smooth, and, at the same time, indifferent to chill, so that there is not the same shrinking and shivering as before, should a draught blow over his bed. And these are not the only advantages of inunction ; but, as was said in the previous chapter, valuable nourishment is got into the body without calling for exertion on the part of the digestive organs.

Of far more importance in the treatment of a feverish consumptive patient than inunction, or the appliances either of hydropathy or pharmacy, is pure air. However cold this may be, it is always heated to a suitable temperature before it reaches the lungs, provided the patient inspire through his nostrils alone. Some persons indeed maintain that they find this impossible, and in such cases the use of the respirator is of great value. Not, however, such a respirator as admits the air to the lungs through the same passages that the foul air from the lungs is expelled. By this means, the air inhaled is indeed warmed, but it is contaminated at the same time. The moisture and the non-gaseous effete products of respiration collect in the passages and pollute the fresh air as it is drawn in. Respirators, if used at all, should be such as those described by Professor Tyndall as the invention of Mr Carrick, by means of which the air is admitted and filtered free from mechanical impurities through one set of passages; the foul air from the lungs being prevented by a valve from passing through these, and expelled by other channels into which the admission of air from without is similarly prevented by a valve.

The food of a consumptive patient who is suffering from fever must, as has already been said, be as nourishing as possible; and the higher the fever be, the more need there is for this. But as appetite is almost completely gone, and the digestive organs share in the debility of the system, such nourishment must be selected as makes but little demand upon mastication or the powers of digestion. Fresh unskimmed milk, sipped slowly and retained in the mouth for some time before swallowing it, will rarely be found to disagree. Even it, however, may prove too much for the digestion of some ; and when this is found to be the case, skimmed milk, or what is still more easily digested, butter milk, may be substituted either in whole or in part. It must not be forgotten that milk is virtually a solid food ; and it must therefore be taken at regular intervals like ordinary meals. It is well, however, that the meals of a consumptive patient, especially if he be feverish, should be more frequent than those of a man in good health ; as digestion is almost always more or less impaired in such persons, and less nourishment, therefore, can be taken at a time.

A very excellent article of diet is the extract of malt, which may be given in quantities of one or two ounces at a time, dissolved in milk or plain water. The extract used should be a simple pharmaceutical extract, not the strong beer known as Hoff's extract of malt, which often induces biliousness and torpidity. Broths made of rye meal, lentil meal, or pea flour, are often very grateful to the patient. The juice of raw meat, or the *purée de viande* made by mincing lean butcher meat, braying it in a mortar, and then passing it through a hair sieve, often effects great improvement in the state of consumptive patients. The disgusting taste of these last may be almost completely disguised by stirring either of them into a plate of *tepid* well-seasoned soup.

If the stomach will bear it, pure cod-liver oil, as free from taste and smell as possible, should be given to all consumptive patients, whatever stage of the disease they may be in, and whether they be free from fever or not. Apart from its value as a general nutrient, this medicinal food is of special use in promoting a complete, instead of an imperfect, fatty degeneration of inflammatory exudations in the lungs. Indeed, it may be said without fear of contradiction that cod-liver oil effects more benefit in the treatment of consumption than all the other articles of the pharmacopœia put together. While using it judiciously, the patient generally gains in strength and weight; his cough is relieved, or disappears altogether; the physical signs detectable on listening to the chest become less marked, and, if the disease be in the first stage, they may entirely disappear. The beneficial effect of cod-liver oil on consumptive and scrofulous patients is much aided by the addition of a few drops of syrup of iodide of iron to each dose. Unfortunately, many persons can tolerate neither cod-liver oil nor preparations of iron; the oil producing indigestion and loss of appetite, and the iron causing fulness of the head or even positive headache.

In many cases the oil may be prevented from disagreeing by taking it with a little tincture of nux vomica and after meals only; and a useful precaution is always to begin its use in very small doses. If the stomach be very delicate, it had better be administered in the form of emulsion, which, if skilfully prepared, will seldom be found to disagree with patients even of the weakest digestive powers.

Many years ago the use of the hypophosphites was introduced into practice by Dr J. F. Churchill. Of the great value of these salts in many cases of consumption there can be no question : but, unfortunately, if they fail to do good, their action is seldom indifferent, but is almost invariably productive of harm by increasing the fever and spitting of blood. Still, in suitable cases, and administered in doses of from three to five grains, great benefit is often effected by them, especially by the hypophosphite of lime. The value of these preparations, however, is not for an instant to be compared with that of cod-liver oil in the great majority of cases. But often, after improvement ceases to be effected by the use of cod-liver oil, the addition of a few grains of hypophosphite of lime or soda to each dose will cause increase of appetite, gain of flesh, and general improvement in the condition of the patient.

Some years ago Dr Marcet suggested that consumption might be regarded as a septic disease—that is, a disease in which the process of putrefaction is going on, not only in the morbid secretions of the lungs, but in the blood and tissues generally. Dr Clifford Allbutt, in his articles on "Davos as a Health Resort," contributed to the *Lancet* for 1877, puts forward somewhat similar views. In these papers Dr Allbutt speaks of the division of phthisis into tubercular and non-tubercular as antiquated, with, I think, perfect justice. He states that we must regard the ulcerated lung of a phthisical patient as differing in no essential respect from ulcerations elsewhere, and that the difficulty with which it is healed is due to its being, unlike external ulcerations, inaccessible to local treatment, and to the putrefaction of the morbid secretions, which keep up local mischief by their irritating influence upon the lung, and bring on fever by being absorbed into the blood. Dr Allbutt considers that the benefit derived by consumptive patients by residence in Davos is attributable to the purity of the air, which does not permit of putrefaction taking place.

It certainly is unquestionable that the discharges from the phthisical lung are generally more or less putrid, and that the bodies of persons who have died of consumption undergo decomposition with more than ordinary rapidity. The hectic fever of consumptive patients is, therefore, probably due in large measure to the absorption into the circulation of the putrid matter from the lungs.

With the object of arresting the process of putrefaction going on in the lungs and body generally, antiseptics, such as carbolic acid and creasote, may be given in suitable doses either by the mouth or by sub-cutaneous injection, as well as by inhalation. Should it be decided to give either of these antiseptics by the mouth, it is advisable that they should be administered dissolved in cod-liver oil; as by this means both the taste and smell are rendered less observable, and irritative action on the stomach is prevented. The dose of either is from one to two minims, which may be suspended in solution of gum arabic or in syrup, if the patient cannot be persuaded to take cod-liver oil. Pure carbolic acid, being a solid, must of course be liquefied by the aid of heat before it can be measured. If given after food only I have never found that disturbance of the stomach has been produced either by creasote or carbolic acid. The administration of either of these remedies by subcutaneous injection certainly produces reduction of the feverish temperature more promptly than when they are given by the mouth; but the operation is by no means painless, and is seldom really necessary.

Antiseptic inhalations are almost always of value in consumption, whatever be the stage of the disease. In the first and second stages, where there are inflammatory products to be expectorated, such inhalations are better given in the form of fine spray by means of a special apparatus, such as Siegle's inhaler. In the stage of excavation, however, all that is necessary is simply to put a few drops of the antiseptic upon a piece of cotton wool, which is then to be placed in a little linen bag or inclosed in a single fold of a handkerchief. This is placed before the nostrils, and the patient draws the air through the cotton wool, taking it, at once impregnated with the antiseptic and free from mechanical impurities, into his lungs. The cotton wool must, of course, be removed during the act of expiration to prevent its being contaminated by the effete products of respiration.

Counter irritation over the affected part of the lung, by means of fly blisters, frictions with croton oil or tartar emetic ointment, has frequently been recommended; and it is unquestionable that benefit is often derived from such treatment. It is well, however, in effecting counter-irritation, to do so by means which do not break the skin, as is done by the above three applications. Such a means we possess in diluted nitro-muriatic acid, which has long been highly esteemed as a counter-irritant in inflammation of the liver, and is not less valuable in the inflammatory condition of the lung which exists in consumption. The diluted acid should not be kept in quantity, but should be prepared at the time of using. It must be employed of various strengths according to the degree of tenderness of the patient's skin. Generally a mixture of one part of the strong acid with nineteen of water will be found sufficiently strong; and it may be well to begin the treatment with even a weaker solution. The acid must be applied either on spongio piline or on two or three folds of flannel covered with oiled silk. The effect of this application is generally to produce considerable prickling, and frequently free perspiration from the part with which it is in contact. A great advantage of this means of counter-irritation is that, the skin being unbroken, it can be repeated as frequently as may be thought desirable.

Having subdued the fever and with it any active inflammation going on in the lung, our next object must be to try to effect expectoration and reabsorption of the exudation that has been poured into the air-cells and infiltrated into the lung tissue during the inflammatory process.

There is now no longer any reason for keeping the patient at rest in bed. On the contrary, we must call in the aid of exercise to assist nutritious diet in producing such activity of the circulation as is necessary for the restoration of healthy function to the parts of the lung that are loaded with inflammatory exudation, but in which the blood-vessels have not been obliterated. On all consumptive patients free from fever, daily exercise in the open air must therefore be enjoined. If the patient's means permit and he be not too feeble, riding is the most suitable form of exercise that he can take; or, if his strength be not sufficient for this, driving in an open carriage may be substituted. If neither of these forms of exercise be attainable by the patient, he must be content with walking or sitting well wrapped up in the open air; but whether he ride, drive, or walk, he must remember to stop his exercise on the slightest approach of exhaustion.

Unfortunately there is no class of patients so injudicious as sufferers from consumption. Either they give themselves up for lost, believing that their disease is one of which no cure can be effected, and therefore cannot be persuaded to exert themselves sufficiently to follow out the instructions of the physician; or, what is scarcely less disastrous, no sooner do they experience decided benefit from any particular means of treatment than they proceed to injure themselves by carrying it to excess, under the mistaken supposition that it is impossible to have too much of a good thing. For instance, having heard of Sydenham's famous saying that horseback exercise is not less valuable in consumption than is Peruvian bark in ague, such a patient will sometimes gallop about for the greater part of a day on a restive horse, and return home utterly exhausted, with a recurrence of feverish symptoms, and in a state of such prostration that he is unable to enjoy exercise in the open air for many days, if, indeed, he have not ruined his chances of recovery. Similarly we often see the digestive system greatly weakened, and the nutrition of the body consequently impaired, by the patient's rashly taking enormous doses of cod-liver oil in his unreasonable, though natural, desire to get well all at once.

Something must now be said as to the curative effect of climate in consumption.

It was formerly believed that consumption was a disease confined to cold climates; and even yet we hear of patients being sent to Madeira, the coast of Brazil, and other warm regions, under the impression that if consumption exists at all in such localities, it is of the rarest possible occurrence. Such a belief, however, has long been shown to be perfectly unwarranted. In the coast towns of Brazil 20 per cent. of the entire mortality is due to consumption ; and in Madeira, so much valued as a resort for persons with weak or diseased lungs, 25 per cent. of the deaths among the *natives* are from consumption, a mortality which is exceeded in Vienna only. Indeed, it is now well known that phthisis is a disease which is truly ubiquitous, and that geographical position and temperature do not of themselves exercise the slightest influence upon its development. But, once developed, and neglected or unskilfully treated, consumption runs a far more rapid course when the patient is exposed to the debilitating influence of a tropical climate.

Even the doctrine that consumption is incompatible with residence at a certain height above the level of the sea (the supposed necessary altitude being great in the region of the equator and becoming less as we advance towards the poles), has lately received rude shocks. It was formerly believed, for instance, that there existed an absolute immunity from consumption in Alpine regions of an altitude not less than 1500 metres ; but it has been recently shown by Dr J. M. Ludwig that cases of consumption may originate and terminate fatally even in the valley of the Upper Engadine, about 1800 metres above the level of the sea—(" Das Oberengadin," &c., Stuttgart, 1877).

It is indeed far more likely that the comparative immunity from consumption enjoyed by the inhabitants of greatly elevated regions depends on their habits of life rather than on the special virtues of mountain air, undeniably valuable though it be in the treatment of this disease. Such persons, from the nature of their employment as shepherds and hunters, necessarily breathe a pure air during the day, and are not likely to submit to badly ventilated rooms by night; and we know how comparatively rarely persons of such habits of life are attacked by consumption, even on the plains.

Still, the success with which consumption has been treated in the sanitary establishments now so numerous in elevated valleys on the continent of Europe leaves no room for doubt that mountain air is of special value in this disease. Dr Brehmer of Görbersdorf maintains that the virtue of diminished atmospheric pressure consists in its causing a physiological increase in the frequency of the pulse, and therefore accelerated nutrition of the lungs and body generally. On the other hand, it is held by many physicians that the air of elevated regions is healthful simply because of its great freedom from dust and smoke and its richness in ozone; and they further maintain that acceleration of the pulse is comparatively seldom to be observed as an effect of residence in elevated regions, and that when observed it is insignificant.

The balance of evidence is, I think, in favour of the view taken by Dr Brehmer, who, however, does not deny the advantages of the air being rich in ozone and free from mechanical impurities. The experience of aeronauts has amply shown that a constant effect of increased altitude is acceleration of the pulse without feverishness being induced; and, even at the level of the sea, many persons can be found whose pulses rise as the barometer falls, and *vice versâ.*

Some have thought that, owing to the rarefaction of the air in elevated regions, the dwellers there are compelled to take more profound inspirations in order that a sufficient amount of oxygen may be taken into the lungs, there being of course less oxygen in a given volume of air on a mountain top than in the same volume on the plain; and it has been naturally assumed that better nutrition is the necessary result of this increased activity. It is, however, more than questionable that deeper inspiration is necessary in elevated regions. The oxygen there, though more highly rarefied, is also more active. This was well shown by Professors Frankland and Tyndall in the experiments they made on the burning of candles at Chamouni, and on the summit of Mont

Blanc, 12,000 feet higher. On the mountain top the candles burned not less rapidly than below, but with a less luminous flame. Now, the luminosity of a flame depends upon the presence of solid particles in its interior, which are heated to a bright white heat. If air be admitted to the interior of a flame, as in the Bunsen burner, the brilliancy of the light is diminished in proportion to the quantity of air admitted consistently with the possibility of combustion. In this case the gas, being mixed with air, is at once completely oxidised, no solid particles of carbon being liberated in its interior and therefore no brilliant white light being produced. In a locality of great elevation the particles of oxygen in the air, though fewer in number in a given bulk, are more mobile. They therefore penetrate the flame more easily and diminish its brilliancy by effecting more complete combustion of the solid particles in its interior. This greater activity of the oxygen contained in the air in regions of considerable altitude can scarcely be without influence upon the human body; and in such regions we are warranted in expecting more thorough oxidation of waste products and general greater activity of the process of nutrition than under similar circumstances on the plains.

It must not be forgotten, however, that, in sending a patient to such a region for the benefit of his health, he requires the general comforts of life there as much as in his own home. Indeed, unless these can be secured, and there be a certainty of as careful attention being paid to the sufferer as at home, more harm than good may be done by such a change.

It is no doubt desirable that the consumptive patient should live in a climate where the fineness of the weather tempts him out into the open air and where he is not again driven within doors by oppressive heat. But such climates are rare; and still rarer are the patients who can avail themselves of the advantages they offer. Indeed, all things considered, it is seldom wise to counsel a patient to leave his own shores. Within the compass of the British Isles many varieties of climate are to be found; and we should take advantage of these before seeking for change in a foreign land.

It cannot be too often or too strongly insisted upon that fresh air by day and by night is all essential in the treatment of phthisis. If the fresh air can be warmed before admission to the house so much the better; but, if not, the heat of the body may be retained by light warm clothing; and cold air, breathed through the nostrils, is no longer cold when it reaches the lungs Even for a healthy person to sleep in a room with an open window is often stigmatised as an act of folly; and it may be thought the height of rashness to recommend that a consumptive patient should do so. Yet, if there be one well-established fact in medical science, it is that re-breathed air is a most potent exciting cause of consumption; and since consumptive patients have been dying all along in rooms with a temperature like that of hothouses, from which every breath of fresh air is excluded, we are warranted in assuming that more harm can scarcely be done by cold air, even if that were a necessary consequence of open windows. But there is no reason why a room should not be comfortably warmed and yet free ventilation maintained by means of open windows or otherwise. If, however, a choice must be made between cold air and air polluted by the emanations from our own lungs and bodies and those of others, unhesitating preference should be given to the former. I have never known, and do not expect ever to know, of harm having been done by sleeping in a room with a window well drawn down from the top, even in the depth of winter. Although the air of the room be bitterly cold there is no reason why the sleeper should be so. His bed ought, of course, to be placed so that no direct draught may blow upon him, or rather upon his face, as no other part need be exposed when in bed; the window should not be opened until he has undressed and put on warm night-clothes; the bed clothing should be thoroughly ample, down quilts being preferable to blankets, as they retain the heat of the body better and yet do not oppress by their weight; and, finally, on rising in the morning the window should be at once shut to prevent risk of chill when dressing.

Lung gymnastics, and bathing, as recommended in the previous chapter, should be regularly carried out; the bath-room, if the patient have the advantage of such a luxury, should be comfortably warmed; but, if this be not within his reach, stimulation and cleansing of the skin by some means must not be neglected. The great object of this is to render the skin unsusceptible to chill; and it is wonderful how much can be effected in this direction by rubbing the body first with a wet and then with a dry towel, or even with a dry towel only.

A few words must be said as to the special treatment of cough, night sweats, and bleeding from the lungs in consumption.

It is never justifiable to administer morphia or other preparations of opium for the purpose of relieving the cough, except in cases where there is such toleration of these remedies that digestion and appetite are not interfered with by their use, or where the distress caused by coughing may be judged to be more hurtful to the patient than the impaired nutrition resulting from the administration of such medicines. In most cases, fixation of the upper part of the chest by strips of roborans plaster, as recommended by Dr Macrae, relieves coughing as effectually as the internal use of opium, and is of course without any hurtful influence upon appetite and digestion. When this means of treatment is adopted, the patient must necessarily be confined to bed.

The exhausting *night sweats*, or, more correctly, morning sweats, so common in consumption, were observed by Dr Edward Smith to break out when the pulse had become languid and diminished in frequency sometimes even beyond what is natural to health. He therefore recommended the administration of wine or cold tea with a view to strengthen the action of the heart and thus prevent exhausting sweating, and further, that as sleep during the day was attended with a less marked lowering of the pulse than by night, the patient should be awakened early in the morning before the outbreak of perspiration, making up by rest during the day for what had been taken from the night. This, however, will seldom be found necessary, if sweating have been artificially produced by means of the wet pack in the evening before going to bed, and, as recommended by Dr Brehmer, a glass of milk with a few teaspoonfuls of genuine brandy be administered either then or in the early morning before the usual time for the accession of sweating.

Nothing more alarming can occur during the course of phthisis than *copious expectoration of blood;* but, fortunately, if this be not immediately fatal, nothing is more easily arrested. Five or six grains of ergotine, dissolved in a little glycerine and water and injected subcutaneously, arrest bleeding from the lungs almost instantaneously. Even given by the mouth this drug is very effectual; but its action is slower and it requires to be given in a larger dose than when administered subcutaneously. From the relief experienced by almost all patients after the expectoration of blood, it has been considered by some medical men as injudicious to attempt to arrest the bleeding. The oppression, however, from which the patient has obtained relief by the hæmorrhage, is a result of congestion; and by counter-irritation we can relieve congestion as effectually as by bleeding, and without draining away the strength of the patient.

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